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# An approach to mine time interval based weighted sequential patterns in sequence databases

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## An Approach to Mine Time Interval Based Weighted Sequential Patterns in Sequence Databases

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Sirisha Alamanda ; Suresh Pabboju ; Narsimha Gugulothu [All Authors](#)

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**Abstract:** Sequence pattern mining is an important data mining task with broad applications. Many sequence mining algorithms have been developed to discover frequent sub-sequences as sequential patterns in a sequence database given the minimum support threshold. One of the drawbacks with the conventional sequential pattern mining is, it considered only the generation order of elements in the sequences in finding sequential patterns. However, in real world application domain sequences, the generation times and time-intervals between the elements are also very important. Another drawback is, all the sequence patterns are treated uniformly while in reality different sequential patterns have different importance. To address the second drawback, weighted sequential pattern mining was proposed, which aims to find more interesting sequential patterns, by considering different significance for data elements in a sequence database. However, weighted sequential pattern mining did not consider time-interval information of the sequences. This paper presents a new approach for mining time-interval based weighted sequential patterns (TIWSP) in a sequence database. In the proposed approach, the weight of each sequence in a sequence database is obtained from the time-intervals of successive elements in the sequence, and then sequential pattern are mined by considering the time interval weight. Experimental results show that TIWSP mining is efficient than PrefixSpan in generating more interesting patterns.

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## Hexagonal Image Processing and Transformations: A Practical Approach Using R

[E. Ramalakshmi](#)  & [Neeharika Kompala](#)

Chapter | [First Online: 23 December 2017](#)

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### Abstract

Hexagonal structure is remarkable in connection to the standard square structure for picture depiction. The geometrical course of action of pixels on hexagonal structure can be portrayed similar to a hexagonal system. Hexagonal structure gives a straightforward way to deal with picture translation and turn information. Winding Architecture is a reasonably new and competent approach to manage machine vision structure. Regardless, all the present hardware for finding picture and for indicating picture are made in light of rectangular building. It has transformed into a noteworthy issue impacting the pushed research on Spiral Architecture. In this



# DYNAMIC PHONE WARPING – A METHOD TO MEASURE THE DISTANCE BETWEEN PRONUNCIATIONS

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## ABSTRACT

*Human beings generate different speech waveforms while speaking the same word at different times. Also, different human beings have different accents and generate significantly varying speech waveforms for the same word. There is a need to measure the distances between various words which facilitate preparation of pronunciation dictionaries. A new algorithm called Dynamic Phone Warping (DPW) is presented in this paper. It uses dynamic programming technique for global alignment and shortest distance measurements. The DPW algorithm can be used to enhance the pronunciation dictionaries of the well-known languages like English or to build pronunciation dictionaries to the less known sparse languages. The precision measurement experiments show 88.9% accuracy.*

## KEYWORDS

*Natural Language processing, word distance measurements, pronunciation dictionaries.*

## 1. INTRODUCTION

Pronunciation dictionaries are not available for all languages and the accents of various regions. This paper aims to build online pronunciation dictionaries using sound distance measurements. Human beings hear a word; compare it with the words in the memory and select the word which highest similarity to the input word. The objective of this paper is to follow the technique adopted by the human beings and prepare the pronunciation dictionaries. The primary focus of this paper is to measure distances between and sounds and to use this data to measure the distances between the words.

The reasons for the pronunciation variability are as under:

**1.1 Speaker's Accent:** The accent of the speaker depends on his mother tongue [1, 2]. The difference is negligible in respect of the speakers of the same country. But the difference is glaring in respect of foreign speakers.

**1.2 Speaker's Emotions:** The pronunciation of the same word would be different when spoken with different emotions like joy, love, anger, sadness and shame [3, 4].

**1.3 Speaking Style:** The speaker style varies when speaking to various people. The same name is spoken with different pronunciation while addressing an office peon and while addressing your friend.

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## AUTOMATIC FRAMEWORK OF MUSIC RINGTONE EXTRACTION FROM TOLLYWOOD SONGS

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**Abstract:** An automatic framework is used to extract the ringtones from music automatically. In this, song is considered as the grouping of segments of music such as intro, chorus, verse, bridge, outro. Mostly the ringtone will be the 'chorus' or 'intro' segments of music. The process of manually checking each song and cropping specific parts of the song is a tedious process. Western music and Bollywood songs are widely used for ringtone extraction. The accuracy is not stable for different genres of the songs such as hip-hop, ghazal etc. work, for automatic extraction of ringtone, beat tracking is done by using Simon Dixon BeatRoot followed by feature extraction process as the audio data lies within beats. Songs from Tollywood (regional) were used for experimentation. SVM and Naïve Bayes classifiers are used for comparisons. The class labels are predicted based on training samples. The accuracy gained by SVM is 62.9% with 11093 beat data and the Naïve Bayes classifier gained 75% accuracy with the same beat data. In the two datasets of experimentation Naïve Bayes performed better than SVM.

**Index Terms** - BeatRoot, Feature Extraction, Classification, Segment Boundary Detection.

### I. Introduction

Automatic music extraction is very useful in significant fields. In this a song is taken as input and divided into segments which are considered as meaningful regions such as verse or chorus. The structure of song is usually divided into intro, verse, chorus, outro, etc. Ringtone is an audio file played on mobile phones to indicate an incoming call. Ringtones are popular because in a crowd of people with cellular handsets it is easy to identify easy whose phone is ringing.

Ringtones and ring-music bring more fun when people make calls and it remains as labor intensive work, people need to listen each and every song to set the starting point and ending point for a clip with in audio file, then extract the segment [1]. In this paper our main goal is to extract the ringtone automatically by detecting the boundaries of segments correctly with good accuracy.

Song forms are made up of a number of sections that may or may not be repeated within the same song. Some of the popular song structures are strophic (AAA) form, AAB (12 bar blues) form, AABA song form, AB or verse/chorus song form, ABC song form or verse/chorus/bridge song form. South Indian music song forms are very similar to western music forms.

#### A. Genres of Telugu songs

In music genre refers to musical style. Some of the popular genres of Indian music are [2]:

- Classical: The composition of classical music is based on ragas, which are the scales of seven basic

notes such as sa, re, ga, ma, pa, dha and ni. The commonly played musical instruments of this genre includes sitar, surbahar, sarod, sarangi, santoor, bansuri, pakhavaj and tabla.

- Ghazal: According to Arabic dictionary the word ghazal means 'talking about woman', it is generally a poem consisting of five to fifteen couplets known as 'shers'. The ghazals became a part of the Indian music with the invasion of Mughals.
- Pop- Indipop music is a hybrid of Indian and western musical traditions.
- Devotional: Bhakti or devotion, constitutes an important part of Hindu religious practice. The broad sweep of devotional music includes chants and readings of scriptures such as the Vishwasahasranam, Shivamahimmah stotra, Bhagavad Gita and holy mantras, such as Om Namah Shivaya.
- Folk: India folk music owes its origins to the villages, which represents the folklore and lives of the villagers
- Tribal: Indian tribal music is originated from the inhabitants of the hilly regions and they are composed among the tribals of northeast India and southern states.

Folk and tribal music was composed and performed in order to celebrate a particular festival or to deliver a message.

#### B. Structure of Indian song





# Suitability of Ionospheric Coefficients for IRNSS Single Frequency Receivers

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**Abstract**—For single frequency navigation receiver, there are various techniques to estimate the ionospheric delay. Klobuchar model is a standard technique for single frequency signal that is used to estimate the ionospheric delay globally. It uses two sets of ionospheric coefficients, namely, alpha and beta, to compute the ionospheric delay. There are two different ionospheric model coefficients for IRNSS and GPS. This paper compares the estimation of ionospheric delay using single frequency (two sets of ionospheric model coefficients) and dual frequency signals. The dual frequency estimation is used to validate the results due to Klobuchar model. The ionospheric delays due to GPS ionospheric coefficients are found more suitable than the delays due to IRNSS ionospheric coefficients.

**Keywords**—GPS, IRNSS, Klobuchar Model, etc.

## I. INTRODUCTION

Indian Regional Navigation Satellite System (IRNSS), now termed as Navigation with Indian Constellation (NavIC) is an autonomous system developed by Indian Space Research Organisation, Govt. of India. It provides signals in two frequency bands, namely, L5 band and S1 band. The propagation of these signals is effected by various errors. One prominent error, namely, ionospheric error, delay the travel time of the signals. Ionospheric delay can be estimated using single frequency and dual frequency signals [1-3]. For single frequency receivers, in particular for civil aviation, ionospheric time delay degrades the positional accuracy. Approximately 50% of the ionospheric time delay can be reduced by the Klobuchar model (1987) that uses two sets of coefficient. In this paper, ionospheric delay is estimated using ionospheric coefficients provided by navigation files of GPS and IRNSS. Also, to validate the results more precise estimation of ionospheric delay is required. Hence, ionospheric delay using dual frequency is also estimated.

## II. DATA ACQUISITION

Under an MoU between Chaitanya Bharathi Institute of Technology (CBIT) and Space Applications Centre (SAC), ISRO two Accoded made IRNSS receivers are installed at CBIT, Hyderabad. Extensive research work and several experiments are carried out. Data is continuously acquired, stored and shared with SAC periodically. This paper uses Receiver Independent Exchange (RINEX) and Comma Separated Value (CSV) data provided by the receiver. The CSV data provided by the receiver is termed as IRNSS Receiver Software (IRS).

## III. METHODOLOGY

The navigation message of the GPS and IRNSS contains ionospheric Alpha and Beta coefficients. Klobuchar model use these coefficients with Elevation and Azimuth angle

between the user and satellite [4]. The vertical ionospheric time delay ( $T_{vd}$ ) is given as:

$$T_{vd} = f \left[ 5 \times 10^{-9} + \sum_{n=0}^2 \alpha_n \theta_n^n \times \left( 1 - \frac{x^2}{2} + \frac{x^4}{24} \right) \right] \quad (1)$$

where

$$x = \frac{2\pi f (t - 50400)}{\sum_{n=0}^2 \beta_n \theta_n^n}$$

$\alpha$  and  $\beta$  Ionospheric coefficients from navigation file  
 $\theta_n$  Geomagnetic latitude (semi-circles)  
 $f$  Slant factor

As the delay due to GPS coefficients are for L1 frequency, the calculated delay is converted for L5 frequency using a correction factor of 1.7934. Klobuchar model provides vertical ionospheric delay, hence, it is converted to slant ionospheric delay. To estimate the slant ionospheric delay, the vertical delay is to be multiplied with a standard mapping function. The most commonly used Mapping Function (MF) to calculate slant ionospheric delay is given as [5].

$$MF = \left( 1 - \left( \frac{R_e \times \cos(e)}{R_e + h_{iono}} \right)^2 \right)^{-\frac{1}{2}} \quad (2)$$

Where  $R_e$  is the earth radius (6371 km),  $e$  is the elevation angle between user and satellite and  $h_{iono}$  is the ionospheric thin shell height considered as 350 Km in this analysis.

The ionospheric delay is directly provided by the IRS software. Apart from this, code measurements are used to estimate the ionospheric delay using dual frequency data. Ionospheric delay is given as

$$I_f = \frac{403}{f^2} \times TEC \quad (m) \quad (3)$$

where,  $f$  is frequency (Hz), TEC is Total Electron Content ( $el/m^2$ ).

Total Electron Content (TEC) is defined as the total number of electrons a signal experience with a cross sectional area of  $1 \text{ m}^2$ . TEC due to code measurements is given as [3,6].

$$TEC_c = 44192 \times (P_1 - P_2) \quad [TECU] \quad (4)$$

where,  $P_1$  and  $P_2$  are the pseudoranges from S1 and L5 frequency respectively.

## IV. RESULTS AND DISCUSSION

Several days of data has been analysed, but, for convenience results due to only two typical days (21<sup>st</sup> July and 30<sup>th</sup> July 2018) are shown. Estimation of ionospheric delay for 21<sup>st</sup> July and 30<sup>th</sup> July 2018 are shown in Fig. 1 and 2 respectively. Two results are due to Klobuchar model and

# Analysis of Ionospheric Delay Effects on IRNSS-GPS Receiver Coordinates

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**Abstract**— The ionosphere is one of the major error sources in today’s GNSS receivers for accurate position estimation. The signals from the satellites experience delay when propagating through the ionosphere resulting in error in position estimation. Various models and mathematical formulations have been developed to estimate the range error due to ionospheric delay. This paper investigates the effect of ionospheric delay on IG (IRNSS-GPS) receiver position coordinates (x, y and z). The position error and standard deviation of each coordinates is estimated. Also, 2D (x and y coordinates) position accuracy of IG receiver is estimated by using CEP, DRMS and 2DRMS. It is observed that, y coordinate is more effected and this aspect may be useful in analyzing the timing accuracy estimation.

**Keywords**—IRNSS-GPS, ionospheric delay, CEP, DRMS and 2DRMS

## I. INTRODUCTION

Indian Regional Navigation Satellite System (IRNSS) is an indigeneous regional navigation system, developed and controlled by Indian Space Research Organization (ISRO). It operates both in L5 and S1 band of frequencies. The IRNSS receiver consists of 7 satellites (3 GEO and 4 GSO) namely IRNSS-1B, 1C, 1D, 1E, 1F, 1G and 1I.

Ionosphere is one of the prominent sources of error in satellite navigation resulting in error in the xyz components and the position estimation consequently[1]. Several researchers presented 2D position accuracy in the context of GPS [2-4]. Similar work is done on comparative analysis of single and dual frequency of ionophertic delay effects on user position accuracy in the context of GPS [5]. Recently, significant work is done on the performance evaluation of IRNSS-GPS-SBAS receiver in terms of position and accuracy [6]

## II.THEORITICAL BACKGROUND

The geodetic coordinates of GNSS receiver can be (latitude, longitude and altitude) converted to Cartesian coordinate (x, y and z) components as follows [7]

$$x = (n + h) \cos(\phi) \cos(\lambda) \tag{1}$$

$$y = (n + h) \cos(\phi) \sin(\lambda) \tag{2}$$

$$z = [(1 - e^2)n + h] \sin(\phi) \tag{3}$$

Where  $\phi$  is latitude (deg),  $\lambda$  is longitude (deg), n is radius of curvature of the earth (meters), h is ellipsoidal height (meters) and e is the eccentricity of ellipsoid, a and b are semi-major and semi-minor axes of the ellipsoid,  $O_p$  and  $I_p$  are the points outside and on the surface of the ellipsoid respectively (Fig.1). From the equations (1, 2 and 3), it is evident that the variation in x and z coordinates is minimum at low latitude and high longitude angles for a given eccentricity, ellipsoidal height and radius of curvature of the earth. Whereas, the variation in y coordinate is

maximum for low latitude and high longitude angles. In the paper, we did analysis for a low latitude and high longitude station, Hyderabad (17.3921° N, 78.3195° E). We also simulated and verified that, variation in y-axis is more than in x-axis and z (Fig. 2)

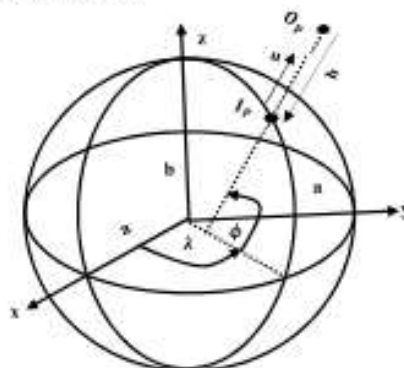


Fig.1 ECEF coordinates of GNSS receiver

The 2D position accuracy is measured in IGS (IRNSS+GPS+SBAS) receiver from the scatter plot using Circular Error Probability (CEP). The receiver logged the positions over period of a time, positions are spread over an area due to measurement errors called scatter plot. The GNSS receiver designers used various methods like CEP, Distance Root Mean Square (DRMS) and 2DRMS to characterize the position accuracy. The CEP is described as the radius of a circle with true position as the center, which contains the probability of 50% error values with in circle, given by [8]

$$CEP = 0.56\sqrt{\sigma_x^2} + 0.62\sqrt{\sigma_y^2} \tag{4}$$

Where  $\sigma_x$  and  $\sigma_y$  are standard deviation of x and y coordinates respectively.

In order to characterize the 2D position accury by using DRMS, first need to estimate the standard deviation of position coordinates (x and y). The DRMS is defined as square root of sum of squares of standard deviation of x and y position coordinates. The DRMS circle contains the probability of 65% error values with in the circle, is expressed as

$$DRMS = \sqrt{\sigma_x^2 + \sigma_y^2} \tag{5}$$

Similarly, 2DRMS is defined as twice the value of DRMS. The 2DRMS circle contains the probability of 95% error values with in the circle, is given by

$$2DRMS = 2 * \sqrt{\sigma_x^2 + \sigma_y^2} \tag{6}$$

These parameters are most commonly used position accuracy measures for GNSS receivers



# Sierpinski Monopole Antenna Reconfigurable System using Hairpin Bandpass Filter Sections

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**Abstract**— In this paper, the design and development of a Sierpinski monopole gasket antenna reconfigurable system cascaded with two hairpin bandpass filter sections is presented. The reconfigurability is achieved by incorporating PIN diode switching mechanism to select the appropriate filter section to resonate the antenna at a desired frequency of interest. The proposed structure is aimed to be operated at 3.5 GHz and 7.5 GHz with good amount of gain, bandwidth along with the reduction of interference at the receiver. The proposed model is verified using the commercially available simulating software CST Microwave suite and a prototype is fabricated and tested accordingly. The simulated results are compared with the measured values and the corresponding results are presented. The simulated results shows that the antenna is resonating at 3.5 GHz and 7.5 GHz for a measured values of 3.48 GHz and 7.5 GHz with the appropriate selection of the switching mechanism. The antenna demonstrates a gain of 9.8 dBi and 6.2 dBi when simulated corresponding to a measured values of 10.1 dBi and 7.1 dBi respectively. The antenna offers a bandwidth of 60 MHz and 100 MHz when simulated and 50 MHz and 180 MHz after the practical measurement at the operational frequencies. Nearly a 26 dB of separation of measured power levels between the operating frequencies can be observed at the receiver. The structure is better suitable for the Cognitive Radio applications as it offers better values of gain, bandwidth and reduced interference levels at the receiver along with design flexibility.

**Keywords**—Sierpinski Monopole Gasket, Hairpin Bandpass Filter, PIN diodes, Reconfigurability, Interference, Gain, Bandwidth, Cognitive Radio

## I. INTRODUCTION

The growing demand for the wireless connectivity has necessitated a new communication technique to exploit the usage of electromagnetic spectrum in an efficient way. The Cognitive Radio (CR), a prominent technology is intended for the effective utilization of the spectrum in a systematic approach either by using spectrum underlay or spectrum overlay approach [1]. The most important task in this perspective is the design of an antenna that must be capable of adapting the changes in the environment accordingly. Therefore, the antenna systems should be reconfigurable to cater the needs of the CR framework [2]. The microstrip antennas are considered to be the suitable structures for achieving these performance characteristics owing to their advantages of being compact, lesser in weight, ease of integration with feeding mechanism. At the same time, they have the disadvantage that, they offer lesser values of gain and bandwidth. The fractal antennas are considered to be the suitable components in the design of a reconfigurable antenna system. The Sierpinski gasket fractal antennas [3] in particular, allow the design of dynamic structures to obtain the frequency reconfigurability mechanism using suitable switching mechanism. This is due to the nature of their

multi-band operational characteristics with reasonably good operational band width and systematic utilization of the spectrum for the efficient communication. Similarly, the monopole configuration offers more gain and band width when compared to dipole arrangement [4]. However, it is essential to note that maintaining the constant gain over the band in a reconfigurable antenna and reducing the interference between the operating frequencies at the receiver is a serious challenge when working at different resonant frequencies. These challenges can be solved by integrating appropriate antenna structures with reconfigurable filters [5]. In this context, the hairpin bandpass filters are considered to be the more appropriate structures for achieving good pass band characteristics as they are compact, simple in design, easy to fabricate at lower costs [6]. Moreover, they offer lesser coupling losses when compared to other coupled line filters and so on. Therefore, these two components can be cascaded together to select a particular resonant frequency by proper switching mechanism. Such arrangements will help to maintain uniform antenna surface current distribution over the structure at a particular frequency and avoids the alterations by tuning the filter components [7] due to which the antennas offer constant gain over a frequency range of interest. On the other hand, the noise performance of the overall system can be improved and interference is minimized effectively at the receiver end due to the independent operation at a given frequency. The frequency reconfigurability of these structures can be obtained by incorporating appropriate PIN diode switching circuitry [8] along with the cascaded hairpin band pass filters. The PIN diodes are also helpful in providing further isolation and to reduce the interference at the receiver. These systems are more dynamic, compact and can be designed easily with stable radiation characteristics, reasonably good values of gain and bandwidth. The similar kind of structures that are available in the literature [9] [10] could not provide the higher values of gain and bandwidth and they do suffer from the coupling losses and interference. Therefore, this paper aims to resolve the problems that are identified from the literature by adopting a different mechanism. The proposed antenna system consists of a sierpinski monopole gasket cascaded along with suitable hairpin bandpass filters operated by the appropriate PIN diode switching mechanism to obtain the reconfigurability. Even though, the Sierpinski monopole gasket can offer multi band operation, i.e at 1.75 GHz, 3.5 GHz, 7.5 GHz, 11 GHz, the proposed structure is designed to operate only at 3.5GHz and 7.5 GHz by using the proper switching mechanism considering the practicality of the design. The proposed model is verified by using commercially available CST microwave suite [11] and the results are compared with the measured values of fabricated prototype and a good agreement has been obtained.



## Edge Cut Dual-Band Slot Antenna for Bluetooth/WLAN and WiMAX Applications

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### Abstract

A novel edge cut dual-band microstrip slot antenna and dual-band slot antenna are presented. The presented antennas find applications in Bluetooth/WLAN and WiMAX. These antennas use microstrip feed; in dual-band slot antenna, the lower band is considered from about 2.38 to 2.42 GHz, and the upper band is considered 2.59–2.64 GHz, whereas edge cut dual-band slot antenna, the impedance bandwidth of lower band is 2.37–2.43 GHz and the impedance bandwidth of upper band is 2.71–2.76 GHz. For dual-band antenna, the center frequency for lower band is 2.4 GHz and for upper band is 2.61 GHz, whereas for edge cut dual-band slot antenna, center frequency for lower band is 2.4 GHz and for upper band is 2.73 GHz which is assumed. The antenna simulations are carried out using HFSS, and a comparison among simulation and measured results is presented in this paper.

### Keywords

Edge cut Dual-band Slot antenna HFSS Microstrip antenna WLAN WiMAX

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### References

# “Investigations of Doppler Collision Effects on NavIC”

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## Investigations of Doppler Collision Effects on NavIC

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### Abstract

Document Sections

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II. IGS Receiver

III. Doppler Collision

IV. Results and Discussion

V. Conclusions

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Figures

References

### Abstract:

Doppler collision is a very important effect that will limit the performance of the satellite navigation systems. Therefore, there is a need to analyze the effect on NavIC (Navigation with Indian Constellation). NavIC is the emerging regional satellite navigation system designed and developed by Indian Space Research Organization, India. This system having seven IRNSS (Indian Regional Navigation Satellite System) satellite constellation consists of three geostationary satellites (IRNSS 1C, 1F and 1G) and four geosynchronous satellites. As the NavIC constellation uses the geostationary satellites, the effect of Doppler collision is more, even though they have orbital inclination angle of about  $\pm 5^\circ$ . In this paper, the effect of Doppler collision for NavIC constellation is analyzed by considering three months data acquired from IGS (IRNSS-GPS-SBAS) receiver. It is found that Doppler collision occurs between IRNSS 1C and 1G is more comparatively IRNSS 1C and 1F & IRNSS 1F and 1G. The Doppler collision period occurs twice in a one sidereal day for all IRNSS geostationary satellites combination. For IRNSS 1C and 1G, the Doppler collision period is about 4 hrs 52 min i.e 18.8% of the one day time (24hrs). These results are useful for changing the inclination of geostationary satellites for avoiding Doppler collision which will improve positional accuracy.

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# “Performance Evaluation of IRI-2016 Model Using IRNSS Data over a Low Latitude Station: Preliminary Results”

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## ***Performance Evaluation of IRI-2016 Model Using IRNSS Data over a Low Latitude Station: Preliminary Results***

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**Abstract**—The International Reference Ionosphere (IRI) model plays an important role in various applications and connected with communication, navigation and other fields. This paper discusses the performance of the latest version IRI-2016 model for estimating the vertical ionospheric delays during geomagnetic quiet (13th May 2017) and disturbed (20th May 2017) days over a low latitude station. The ionospheric delays obtained due to IRNSS L5 (1176.45MHz) signal at low latitude Hyderabad station (17.24° N; 78.31° E), are compared with the results of IRI-2016 model. The obtained results will be helpful in improving the performance of IRI-2016 model over low latitude regions.

**Keywords**—Ionospheric delay, IRNSS, IRI and Low Latitude.

### 1. INTRODUCTION

The ionospheric propagation effects play a critical role on the performance of Communication, Navigation and Surveillance system applications. Precise estimation of Total Electron Content (TEC) would be very helpful in improving the system performance in both civilian aviation and defence applications. The low latitude ionospheric layer is highly dynamic in nature, due to several phenomena such as equatorial ionospheric anomaly (EIA) [1], which can result in variations of different ionospheric parameters such as TEC. These TEC variations affect communication and navigation fields to a great extent. Hence, to understand the ionospheric variations over low latitude regions, modeling of ionospheric time delay is necessary. Accordingly, ionospheric models can be classified as global, regional, and local for estimating ionospheric characteristics of a specific region at a specific latitude, longitude, altitude, time, and geomagnetic activity. The IRI model is one of the standard global models to predict the behavior of the ionospheric layer in terms of various parameters. The IRI model is based on the world wide data available not only from ground based but also from space based systems. In the recent past, several regional ionospheric models are investigated over the Indian region [2-3]. Various investigators observed significant fluctuations in ionospheric time delays over low-latitude regions during the geomagnetic storm days [4-5].

### II. DESCRIPTION OF IRI-2016 MODEL AND IRNSS

In this section we described IRI-2016 model and IRNSS.

#### A. IRI-2016 model

The IRI model is a global ionospheric model and is developed by the Committee on Space Research (CORPAR) and the International Union of Radio Science (URSI). The IRI model is an empirical and data based model to predict the variations in ionospheric layer [6]. This can be used to estimate the values of ion temperature, ion composition, electron density, electron temperature, and VTEC (Vertical Total Electron Content) at altitudes ranging from approximately 50 to 2000 km. When new data and new techniques are available, model is being upgraded continuously. In 1978 the first version of IRI model was released [7]. Later this model was followed by several improved versions in 1986, 1990, 1995, 2001, 2012 and 2016. At present, IRI-2016 is the updated version of the model. The IRI model strongly depends on existing database and the regions which are not covered by database experience reduced reliability of the model. India is one such region and needs careful attention while using this model.

#### B. IRNSS

The IRNSS (Indian Regional Navigation Satellite System) is being developed by India. This system covers India over a range of 1,500 km beyond its borders with 7 satellites constellation. It can provide position accuracy within 10m over the Indian landmass and below 20m over the oceans. It is expected to provide better coverage area and improved accuracy with satellite constellation enhanced to 11 satellites. In the present constellation four satellites are geosynchronous (1A, 1B, 1D, 1E) and remaining is geostationary (1C, 1F, 1G). At present 1A satellite is not operational, its all rubidium atomic clocks on board IRNSS-1A are failed. A new satellite is expected to be launched soon. The system is expected to be operational from early 2018 after a system check. It will provide Standard Positioning Service (SPS) for civilian users and a Restricted Service (RS) for authorized users [8]. Its performance is degraded by several sources of errors such as multipath effects, clock error, DOP (Dilution of Precision),

## ***Multipath and Thermal noise free Relative TEC Estimation using IRNSS L5 and S1 Signals***

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**Abstract**— Indian Regional Navigation Satellite System (IRNSS) is an autonomous system developed to cater navigational and precise time needs over the Indian region and its surrounding. There are various error sources that degrade the positional accuracy of the user. Prominent among them is ionospheric time delay error which is a function of Total Electron Content (TEC). But, the TEC estimation is influenced by the multipath and thermal noise. Therefore, multipath and thermal noise free relative TEC measurements are made and compared with TEC estimated by two other methods, namely, code TEC and IRNSS Receiver Software (IRS) techniques. The L5 (1176.45 MHz) and S1 (2492.028 MHz) signals from IRNSS 1A and 1B satellites are considered in our analysis. The results due to these three techniques indicate that relative estimation technique gives a better performance in terms of smoothness indicating the removal of multipath and thermal noise from the TEC measurements. This will be helpful in proper estimation of ionospheric time delay. In view of this, the relative TEC estimation technique can be used in the IRNSS receiver instead of the present IRS technique.

**Keywords**—IRNSS, TEC, Relative TEC, etc.

### L. INTRODUCTION

Global Navigation Satellite Systems (GNSS) signals are low power signals propagating through space to Earth. They get affected by various parameters in the propagation path. Ionospheric time delay is one of the prominent errors that affect the positional accuracy of GNSS receiver. The ionospheric time delay can be properly estimated when two coherent signals from the same satellite propagate through dispersive ionosphere. For GNSS applications, several ionospheric time delay models are proposed [1]. For these models, precise TEC estimation is necessary. In the case of GPS, the ratio of the L1, L2 and L5 signals ( $L1/L2=1.28$ ;  $L1/L5=1.34$ ) is much less than the ratio of IRNSS S1 and L5 signals ( $S1/L5=2.19$ ). The high ratio of IRNSS signals is expected to facilitate better estimation of TEC. Further, this delay is directly proportional to the Total Electron Content (TEC). It is to be noted that TEC estimation is influenced by the multipath and thermal noise. A signal arriving at an antenna through different paths due to reflection / diffraction represents multipath phenomenon [2]. Thermal noise is a basic electric noise produced by random movement of electrons in any conductor (including components in IRNSS/GPS

receiver)[3]. Once TEC is estimated, the delay can be calculated using a standard expression. TEC can be estimated using either code or carrier phase observations or both. Indian Regional Navigation Satellite System (IRNSS) is a newly added satellite based regional navigation system developed by Indian Space Research Organisation (ISRO). It transmits two frequencies, L5 (1176.45 MHz) and S1 (2492.028 MHz). Recently, a few papers are published on the analysis of L5 and S1 signals [4, 5 and 6]. With the launch of IRNSS-1F on 28 April 2016, the first phase of IRNSS constellation is completed and is declared fully operational [7]. Currently, field trials are going on to analyze the performance of IRNSS at various research organisations and academic institutions in India. Data is available in two formats, namely, Receiver INdependent EXchange format (RINEX) and National Marine Electronic Association (NMEA) data. Apart from these, receiver is also providing data in Comma Separated Value (CSV) format and is termed as IRNSS Receiver Software (IRS) format in this analysis. It contains all the mandatory calculations including user and satellite position information [8]. In this paper, TEC is estimated using three prominent techniques, namely, code, Relative (code and carrier phase) and IRNSS Receiver Software (IRS) techniques. Further, corresponding ionospheric time delay is also estimated for L5 and S1 signals using standard equation. Also, at present IRNSS 1A signal is not being used for position estimation due to failure of three atomic clocks onboard [9]. As data was collected for 17<sup>th</sup> June 2016, this problem was not encountered.

### II. ESTIMATION OF CODE DIFFERENCE AND CARRIER DIFFERENCE OF S1 AND L5 SIGNALS

There are several techniques to estimate ionospheric time delay. One technique is to use code difference measurements of dual frequency receiver. Another technique involves the measurements of both code and phase. These techniques are described in the next section. This section deals with the calculations of the code difference and phase difference of L5 and S1 signals to simplify the calculation of both TEC estimation techniques.

The pseudorange observation equations are given as [10],



## Analysis of PDFs of Ionospheric Scintillation Index Data due to Low Latitude Station

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**Abstract** - Ionospheric scintillations when severe, drastically affects the performance of GNSS system in terms of tracking error, navigation message and C/N<sub>0</sub>. For characterization of amplitude scintillation index, four prominent PDFs namely lognormal, Weibull, Nakagami and Raleigh are considered. The Maximum Likelihood Estimation (MLE) method is used to compute the parameters of the PDFs. The Chi-square goodness of fit is used to choose the best fitting probability distribution. It is found that amplitude scintillation index data variations follow lognormal during daytime (4.27) and lognormal more closely than other density functions in the night time (0.92).

**Index Terms**— GNSS, Ionosphere, Scintillation, PDF

### 1. INTRODUCTION

The performance of the GNSS receiver is degraded by many errors including ionospheric delay and scintillations. Using Space Based Augmentation System (SBAS) grid model, the ionospheric error can be reduced [1]. The refractive index of the ionosphere is a function of free electronics, and fluctuations in refractive index induces fluctuations in the propagating signal. These fluctuations are called as scintillations. Scintillations are a function of operating frequency, local time, season, geomagnetic activity, eleven years solar cycle and geographic location [2]. Scintillations are usually expressed by using two indexes namely S<sub>4</sub> for amplitude and σ<sub>φ</sub> for phase scintillations. Scintillations are more predominant in low and high latitude regions effecting both amplitude and phase of the GNSS signals. Severe scintillation condition can prevent a GPS receiver from locking on to the signal and reduce the performance of the system [3]. The refractive index is a function of free electrons, variations of the scintillation index are random, and the behaviour can be characterized by using a Probability Density Functions (PDFs) [4-5]. Very limited research work has been reported on characterizing ionospheric scintillation index data using PDFs. In one of the research paper scintillation index data was characterized by using Nakagami distribution [6]. To identify which PDF the present low latitude station data exactly follows, four prominent PDFs lognormal, Weibull, Nakagami and Raleigh are considered in the investigation.

### II. THEORETICAL BACKGROUND

For a data consisting of  $\mathcal{P}$  scintillation index data observations  $\{x_n\}$ ,  $n = 1, 2, 3, \dots, \mathcal{P}$ , the empirical PDF,  $f(x)$  is given as [7],

$$f(x) = \frac{\mathcal{P}_i}{\mathcal{P}h} \tag{1}$$

Where,  $h$  is bin size centered at  $x$ , and  $\mathcal{P}_i$  is the number of observations lies between  $x \pm h/2$ . The shape of the probability density curve depends on the bin size.

Several methods are suggested in the literature to identify bin width  $h$  [8]. However, in this paper, we considered lognormal, Weibull, Nakagami and Raleigh PDFs. The expressions for the considered PDFs are as follows [9-10].

i) The lognormal PDF  $f_{ln}(x, \theta_{ln})$  is given as

$$f_{ln}(x, \theta_{ln}) = \frac{1}{x\sigma\sqrt{2\pi}} \exp\left(-\left(\frac{\log x - m}{2\sigma^2}\right)^2\right) \tag{2}$$

where,  $\theta_{ln}$  gives the parameters of the density function with  $m$  as mean and  $\sigma^2$  as variance.

ii) The Weibull PDF  $f_{we}(x, \theta_{we})$  is given as,

$$f_{we}(x, \theta_{we}) = \frac{a}{b} \left(\frac{x}{b}\right)^{a-1} \exp\left(-\frac{x}{b}\right)^a \tag{3}$$

where,  $\theta_{we} = [a, b]$  is a parameter vector with shape (a) and scale (b) parameters.

iii) Nakagami PDF  $f_N(x, \theta_N)$  is given by,

$$f_N(x, \theta_N) = \frac{2m^m}{\Gamma(m)\Omega^m} x^{2m-1} \exp\left(-\frac{m}{\Omega} x^2\right) \tag{4}$$

where,  $\theta_N$  is parameters with  $m$  is shape parameter and  $\Omega$  is scale parameter.

iv) The Raleigh PDF  $f_R(x, \theta_R)$  can be expressed as,

$$f_R(x, \theta_R) = \frac{x}{\sigma^2} e^{-x^2/2\sigma^2} \tag{5}$$

where,  $\theta_R$  is a parameter vector with  $\sigma^2$  variance.

Each density function parameters are computed by using Maximum likelihood estimation method. Chi-square goodness of fit test ( $\chi^2$ ) is used to identify the best suitable probability distribution from the considered distributions.



## Performance Evaluation of Mixed-Pair method of Estimation of Ionospheric Gradients on IRNSS L5 Signals

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**Abstract**—Mixed-Pair method is one of the well-known techniques for estimation of spatial gradients of ionospheric delay. This technique has been extensively used to compute gradients of delay on GPS L1 signals. No significant work is reported on computation of gradients on IRNSS signals using this technique. In this paper, the performance of Mixed-Pair method is evaluated in the context of IRNSS L5 signals. It is observed that with this method, gradients estimated due to the combination of IRNSS 1D and 1E (Geo-Synchronous satellites) is resulting in gradients at short base-lines (tens of kms), whereas, all the other satellite combinations are yielding gradients at long base-lines (hundreds of kms). Therefore, it is inferred that this method can be effectively applied to study the spatial variation of ionosphere over both short and long baselines, especially in IRNSS based DGPS applications.

**Keywords**— IRNSS, L5 signals, Ionospheric spatial gradients, Mixed-Pair method

### I. INTRODUCTION

Indian Regional Navigation Satellite System (IRNSS) is a result of Indian Space Research Organization's (ISRO's), endeavor to have India's own satellite-based navigation system. IRNSS is a regional satellite navigation system that provides Position Velocity and Timing (PVT) information to users over Indian landmass and regions extending to 1500 kms around Indian boundaries. Currently, there are seven satellites in IRNSS constellation, with three satellites in GEO orbit at 83°E (IRNSS 1C), 32.5°E (1F), 131.5°E (1G) and four satellites in GSO orbit at 55°E (IRNSS 1A and 1B) and at 111.75°E (1D and 1E) [1]. The two pairs of GSO satellites move in such a way that they form a figure of '8', while crossing the equator. All the satellites broadcast signals on two frequencies namely L5 (1176.45 MHz) and S1 (2492.028 MHz). Like any other satellite navigation system, IRNSS signals also experience delay as they pass through the ionosphere and systems working on IRNSS L5 band experience larger delays compared to those on S-band. Also, in low-latitude regions, ionosphere is highly variable both spatially and temporally and these variations affect the performance of Differential GPS (DGPS) systems serving both local-area and wide-area. Accurate low-latitude ionospheric time delay modelling and precise estimation of ionospheric spatial gradients play an important role in designing and developing reliable Augmentation Systems [2],[3]. Ionospheric

spatial gradients are estimated using three prominent techniques, namely Time-Step method, Station-Pair method and Mixed-Pair method [4]. In Time-Step method, the difference of ionospheric delays experienced by a satellite at two distinct epochs of time divided by Ionospheric Pierce Point (IPP) separation distance (at those two epochs) results in the estimation of gradients [5]. As IRNSS satellites are either GSOs or GEOs, the time interval between the two epochs has to be sufficiently large to obtain the estimates of gradients over large distances. But, such a huge time interval induces temporal gradient in spatial gradient computations. In Station-Pair method, the difference of ionospheric delays experienced by a pair of stations due to a single satellite, at a particular instant of time, is divided by the corresponding IPP separation distance to estimate the gradients. The disadvantage with this method is that a close network of stations is required to obtain gradient estimates over short base-lines. Mixed-Pair method employs configurations such as one station observing two satellites, two-stations observing two-satellite pairs etc. [6]. In this paper, the performance of this technique is analyzed in the context of IRNSS L5 signals, with an emphasis on the IPP distances covered.

### II. METHODOLOGY

Data is acquired from the IRNSS-GPS-SBAS receivers located at CBIT (17.39°N, 78.32°E) and Osmania University (17.24°N, 78.31°E) stations located at Hyderabad, India. The receiver provides significant parameters such as satellite position, elevation, azimuth, pseudoranges, clock parameters, doppler shift, ionospheric and tropospheric delays, etc for all the satellites in Comma Separated Value (CSV) format. Slant ionospheric delays on L5 signal corresponding to each satellite are extracted from the CSV file and converted to vertical delays with the help of mapping function [7]. The gradients of vertical ionospheric delays are computed using Mixed-Pair method. Two configurations of this method are considered, the first is, one station viewing two satellites and second is, two stations viewing two different satellites.

#### A. One Station - Two Satellites

In this method, the vertical ionospheric differential delays ( $d_{i,j}^v - d_{i,j}^v$ ) experienced by a pair of satellites ( $i, j$ ), with respect to a station ( $R_{i,j}$ ), at a particular instant of time, divided

# Performance Analysis of Different Spatial Domain Methods for Traffic Control Using Image Processing: A LabVIEW Approach

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**Abstract**—In this paper, we present a scheme for performance analysis of spatial domain methods, namely, Laplacian, Arbitrary, Sobel and Prewitt operator methods for traffic control using an image processing with LabVIEW approach, including timing constraints are used to control the signal along the cross-road signal posts. In this paperwork, the reference image and the real-time image captured from the camera is loaded in the image acquisition of LabVIEW. To process the acquired image, four different methods of kernels namely Arbitrary, Laplacian, Prewitt and Sobel methods are used to obtain an edge detection image. The edge detection images have stored and captured images are compared and the Root Mean Square Error is calculated to estimate the timing constraints to operate the traffic signal lights on a four-lane dynamically. LabVIEW graphical programming tools are used for the development of the scheme and simulation results are shown. Finally, the performance of the four methods analyzed using an image quality metric RMSE value to estimate the time in order to allow the vehicles in a particular direction and dynamically to switch them on and off control from one particular direction to another.

**Index Terms**—Image Processing, Laplacian operator, Arbitrary operator, Sobel operator, Prewitt operator, Traffic management.

## I. INTRODUCTION

The spatial domain method, namely Prewitt, Laplacian, Sobel and arbitrary [2,3] are used for edge detection of the stored image and acquired a real-time image. However, the performance analysis of kernel of four different spatial domain edge detection methods. The edge detection method used in time estimation and traffic control is lacking in the literature [4,5]. Therefore, we introduce the scheme using LabVIEW approach and the block diagram is shown in Fig. 1.

In prior, the empty road image is stored in the database, without any vehicles on the road [6]. The image is converted into an array, where four different edge detection methods are applied to convolve with the store image as well as the real-time image captured to generate edge detection of the stored image and the real-time image. The Root Mean Square Error metrics are applied to compute the result analysis of the stored and captured edge detected images. Based on the error obtained, the time estimation is calculated and applied to the traffic light display pole, then the vehicles are allowed to

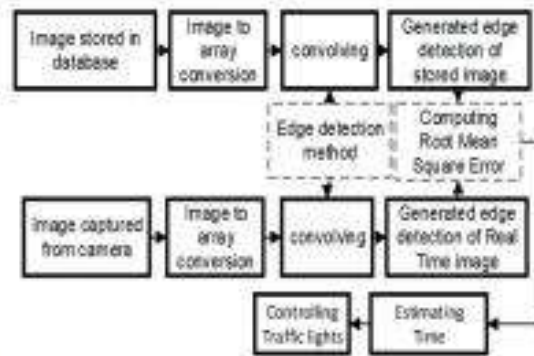


Fig. 1. Block diagram of the edge detection using spatial domain methods.

move in one direction to the other directions. The procedure is followed for all the directions dynamically with respect to the traffic density existing in the particular direction.

Therefore, four different spatial domain edge detection methods are applied to distinguish the edges of the original image. The major problem of the traffic signals is manually done by the traffic police. Hence, focused on automation of timing without human intervention, using camera vision is the approach to reduce the human resource and computational cost. The Sobel operator edge detection method is a discrete differential operator to compute an approximated gradient of an image to change the intensity levels. The remaining three edge detection methods with different types of masks or kernels of the Laplacian (positive and negative) operators, Prewitt (vertical and horizontal) operator, arbitrary operator and Sobel (vertical and horizontal) operator are used for conducting a test on real-time images captured from the specified location. Further, the error estimation on the desired images is calculated to analyze and manage the timing with respect to the lane to switch on and off the signaling of the signal post.

The paper consists of seven sections. Section II states the related work with spatial domain, Laplacian, Prewitt,



# Performance Analysis of Different Transform Methods for Image Steganography: A LabVIEW approach

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**Abstract**— In this paper, we present a scheme for performance analysis of transform methods namely DCST, FDOT, BIOR2.2 and Haar for image steganography using LabVIEW approach with four stego keys with one, two, three and four LSB bits to embed person details in person image (Online e-filing application form). In this work, hidden text message containing the personal details with different payload (1kbyte to 4kbytes) converted into binary, and then the binary hidden message is embedded into the cover image to obtain stego image. The stego image is transformed using DCST, FDOT, bior2.2, and Haar to produce DCST, FDOT, bior2.2 and Haar coefficients. The hidden message using different keys with the original image is retrieved by applying four different inverse transform methods. LabVIEW programming tools are used for the development of scheme presented and execution of the graphical code for simulation. Finally, the performance of the four methods is analyzed using image quality metrics PSNR and MSE with and without steganography.

**Keywords** — Image steganography, Fast Discrete Orthonormal Stockwell Transform (FDOST), Discrete Cosine Stockwell Transform (DCST), Biorthogonal, HAAR

## 1. INTRODUCTION

The transform methods namely DCST, FDOT, bior2.2, and Haar [1, 2] used for compression of stego image [3]. However, the performance analysis of this methods and stego key with more than two LSB bits lack in the literature [4]. Therefore, in this paper scheme using LabVIEW approach presented, the block diagram of this scheme as shown in figure 1. In the person image (cover medium), personal details (embedded message) are embedded using LSB technique to obtain stego image [5, 6]. Then by applying transformation methods to stego image to obtain transform coefficients by using four different transform methods and then transmitted through a medium to the receiver. At the receiver end, the selected inverse transformation method used to retrieve the stego image and LSB technique with correct stego key stood for searching precisely detectable structure in the extracted one, two, three or four bit/s, applied to obtain the text message. The right stego key [7] resolved through a thorough stego key search by measuring the samples of the embedding path. Steganography furnishes with the potential ability to hide the

presence of the secret message and finding hardness of identifying the information embedded in an image.

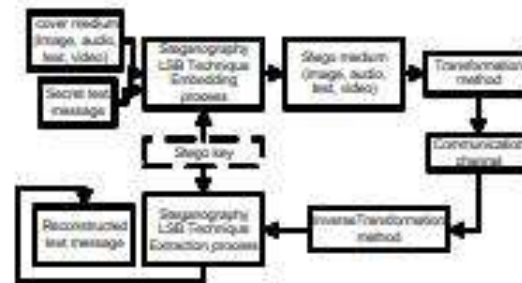


Fig. 1. Block diagram of steganography with transformation method.

Therefore, four different compression methods on stego image applied and transform coefficients being to be transmitted. The related work on the multiresolution disintegration of the Stockwell Transforms (ST) [8, 9] is valuable but redundant and computationally costly. From the beginning of this, we will concentrate on its discrete orthonormal form, the DOST to accomplish the desirable efficiency and compactness. The DOST [10] is a readied adaptation of ST. The multiresolution analysis, the time-based resolution required for a low frequency in view of the sampling theorem. In general, individuals are dealing with low frequency dominated groupings in the field of image processing. In these groupings, the useful information kept in the low frequencies, which makes it sensible to drop some high-frequency information to accomplish a good approximation. Because of the multiresolution nature of the FDOT and Time-Frequency Representation (TFR), an approximation can be performed by dropping or controlling time - or/and frequency - specific FDOT coefficients [11]. Fast Discrete Orthonormal Stockwell Transform demonstrates that, various very straightforward modifications made to get different required properties. For instance, this paper presents a real valued Discrete Cosine-based DOST (DCST) [12]. Finally, we apply the FDOT and DCST in the evolution of direct compression analysis and contrast with bior2.2, and HAAR compression.



“Wavelet Packet: A Multirate Adaptive Filter for De- noising of TDM Signal”  
“Corner cut Inset-fed Dual-Band Slot Antenna for PCS and Bluetooth/WLAN Applications”

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## Corner cut Inset-fed Dual-Band Slot Antenna for PCS and Bluetooth/WLAN Applications

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### Abstract

#### Document Sections

- I. Introduction
- II. Antenna Construction and Design
- III. Results and Discussion
- IV. Conclusion

### Abstract:

Three different antennas such as corner cut inset-fed dual-band slot, inset-fed dual-band slot and inset-fed microstrip antennas are presented. These antennas will find applications in Bluetooth/WLAN, Personal Communications service (PCS) and Global System for Mobile Communication (GSM). The antenna simulations are carried using HFSS. The inset-fed antenna is proposed to operate in frequency range of 2.35GHz to 2.42GHz, which finds application in WLAN. The proposed inset-fed dual-band slot antenna is considered among 1.6GHz to 1.64GHz and 2.38GHz to 2.43GHz. By modulating the proper position of slot, the corner cut inset-fed dual-band slot antenna is proposed to operate among the frequency range for lower band as 1.74GHz to 1.78GHz and 1.92GHz to 1.97GHz and for upper band as 2.38GHz to 2.43GHz. The experiment is also carried out for inset-fed microstrip antenna. A comparison among simulation and measured results are presented in this paper.

“Receiver Bias Estimation of Indian GAGAN System using FRB Technique for Equinox Days: Preliminary Results”

“Estimation of GNSS Receiver Bias using Fitted Receiver Bias (FRB) Method”



### Estimation of GNSS Receiver Bias Using Fitted Receiver Bias Method

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#### ABSTRACT

Global Navigation Satellite System (GNSS) is a collective term given to all the satellite based navigation systems that provides accurate user position, velocity and timing information anywhere in the world. Among various GNSS, GPS is the first operational GNSS. GPS positional accuracy is mainly affected by ionospheric time delay error, which depends up on, the Total Electron Content (TEC) (the integral of the electron density along the ray path between satellite and receiver, it provides the number of electrons per square meter). TEC measurements are corrupted by receiver instrumental bias. The instrumental biases occur due to the frequency dependent delays of analog hardware within the GPS satellite and receiver. Hence, to compute the user position, estimation of receiver bias is essential. One of the simple and less complex method for estimation of receiver bias is Fitted Receiver Bias (FRB) method. To carry out this work, GPS data was collected from two GPS receivers (NovAtel Dual frequency GPS receiver (GSV4004B) at Begumpet (Lat: 17.45°N Lon: 78.47°E) and (GPStation6 (NovAtel) at Hyderabad (Lat: 17.40°N Lon: 78.51°E)), India. In this paper, the receiver instrumental bias of two different receivers was estimated using FRB method. It was observed that estimated receiver bias for NovAtel receiver was -6ms and GPStation6 receiver was -11ms. Two GPS PRN satellites data were considered. In GSV4004B receiver, PRN16, PRN22 and in NovAtel receiver, PRN2, PRN12 satellites were considered. Before removal of instrumental bias, the TEC values obtained were negative values and after removing the receiver bias, the TEC values obtained were positive values. Hence, FRB method is very helpful for estimation of GPS instrumental biases, which greatly helps in improving the user position accuracy for Civilian Applications, such as transportation, search, and rescue operations etc.

**Keywords:** Fitted Receiver Bias, GNSS, Receiver instrumental bias and Total Electron Content

#### INTRODUCTION

Satellite navigation has evolved from being purely under the control of USA, Department of Defense. In the present day, there are multiple GNSS like GPS of USA, such as GLONASS of Russia, GALILEO of the European Union, and Beidou of China. Accordingly, there are Regional Navigation Satellite Systems (RNSS) like Indian Regional Navigation Satellite System (IRNSS) of India, and Quasi Zenith Satellite System (QZSS) of Japan. A user can determine his position - latitude, longitude, and altitude by receiving signals from these satellites with the help of an appropriate GNSS receiver. The position accuracy of GPS system is limited by

## IOT BASED STATUS TRACKING AND CONTROLLING OF MOTOR IN AGRICULTURAL FARMS

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**Abstract**—In India, majority of the population's income by any means depends on agriculture. So it is of cardinal importance to effectively use the technology to enhance vital resources. Nowadays husbandman in agricultural fields are facing many snags due to perceptual power cuts, lack of ground water, motor malfunction. The panacea to overcome motor problems is smart agriculture. This paper gives the solution using raspberry pi3, android and web applications to control the motor using parameters: circuit for tracking power status, ground water availability and motor status. An android application is developed in order to monitor the above three parameters and also to control the motor in farm accordingly.

**Keywords**—IoT, Raspberry Pi3.

### I. INTRODUCTION

IoT is the web of devices and gadgets to transfer the data with no or little human intervention. Hence, to gain high coherence, IoT works in collaterally with agriculture to obtain smart farming. In 21<sup>st</sup> century, many agricultural industries turned to adopt IoT for smart agriculture to improve efficiency, productivity, global market and other features such as minimum time, human intervention, and cost etc. The advancement in the technology drives the sensors to be more economic, reliable and small. As internet is also globally accessible, smart farming can be achieved with full pledge. Focusing on innovation in agriculture, smart farming is the panacea to the problems that agricultural industries is currently facing. The solution can be produced using smart phones and IoT devices. Farmer can get any required data or information as well can monitor his agricultural field.

### II. IOT IN AGRICULTURE

Internet of things has been providing its audacity across the industries such as retail, banking, telecom industry, manufacturers and more. Amidst the various industries, the one sector it is quickly catching up with is, the agriculture. With the concept of digitization and smart farming, it is

gaining popularity like never before and is coming with the potential to offer high precision crop control, data collection and automated farming techniques.

### III. NEED OF IOT IN AGRICULTURE

A prediction by the food and agriculture arm of the United Nations (FAO) bluntly says, that the production of food worldwide should see an escalation of 70% by 2050 to feed the ever growing population. The industrial professionalists believe that IoT could play a vital role in meeting this need. Combined with data analytics, it can improve the efficiency of inputs like soil moisture, fertilizers, pesticides, monitoring the livestock and soil nutrition, predicting plant diseases, monitoring storage capacities like water tanks, and ensuring crops are fed and watered well through sensors and actuators. It shows an overall potency to increase the productivity with a reduced cost.

### IV. PROBLEMS FACED BY FARMERS

We say India is an agricultural country. Yes, it feeds a billion people but let us acknowledge that ours is not a flourishing one. Agricultural sector is in a state of distress, which is severely affecting many farmers. Many farmers are committing suicides because of debt burden, loss of crop. The government has also announced many schemes to resolve these problems. But these schemes are not solutions to farmer's problems because it provides only temporary relief. We witness many suicidal deaths even after the announcement of these schemes. Some problems faced by them are as shown below.

#### A. Irregular Power Supply

The supply of power to Indian agriculture, vital for successful irrigation, is in particularly grave condition. Supply is neither reliable nor of the steady quality needed to avoid damaging the irrigation pumps it runs and severely disrupting irrigation and farming operations. The electricity supply is vital to farmers who use electric pumps to irrigate their fields





# On the Suitability of Ionospheric Gradient Estimation Techniques for IRNSS based GBAS Applications

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**Abstract**—Time-Step method and Station-Pair method are prominent techniques for estimation of spatial gradients. Since GBAS is meant to serve a limited area of about 50km of an airport for aircraft Precision Approach and landing, these two methods were considered for gradient estimation within the GBAS service area. Much of the work on these techniques has been reported for GPS-based GBAS applications. In this paper, the suitability of these methods to IRNSS-based GBAS applications is investigated. It is observed that since IRNSS satellites are either GEO or GSO, the time interval ( $\Delta t$ ), of Time-Step method should be significantly high (30min for GSO), to obtain gradient data for GBAS’ service area. With the Station-Pair method, a dense network of stations, each separated by not more than 1-2 kms is required.

**Keywords**— IRNSS, GBAS, Ionospheric spatial gradients, Time-step method

## 1. INTRODUCTION

Indian Regional Navigation Satellite System (IRNSS) is a regional satellite-based navigation system designed, developed and implemented by Indian Space Research Organisation (ISRO), to provide navigation services over Indian region. It consists of a combination of three satellite in GEO orbit (IRNSS 1C at 83°E, 1F at 32.5°E, 1G at 131.5°E with an inclination of  $-5^\circ$ ) and four satellites in GSO orbit (IRNSS 1A and 1B at 55°E, 1D and 1E at 111.75°E with an inclination of  $29^\circ \pm 2^\circ$ ). All the satellites transmit on two frequencies namely L5 (1176.45 MHz) and S1 (2492.028 MHz). Both the signals experience a delay as they pass through the ionosphere, but S-band signals experience significantly less delay. Also, as India is located in equatorial/low latitude region, severe spatial as well as temporal variability of ionospheric delay is a common phenomenon in this region. The spatial variation of delay (named as spatial gradient) is an important parameter affecting the performance of Local Area DGPS systems like Ground Based Augmentation System (GBAS). Therefore, quantifying and characterizing the gradients is considered as a challenge in the design of robust GBAS systems. Time-step method Station-Pair method and Mixed-Pair method are prominent techniques for estimation of gradients [1],[2]. The suitability of Time-Step method and Station-Pair method was investigated for estimation of spatial gradients on GPS L1 signals within a limited area of 50 kms for Indian GBAS applications and found to be appropriate [3],[4]. In this paper, suitability of these techniques for estimating spatial gradients on IRNSS L5 signals is investigated for IRNSS-based GBAS applications.

## II. METHODOLOGY

Data acquired from the IRNSS-GPS-SBAS receivers located at CBIT (17.39°N, 78.32°E) and Osmania University (17.24°N, 78.31°E) stations, Hyderabad, India, is used in this paper. Dual frequency measurements provide precise estimates of ionospheric delay [5]. Raw code and carrier measurements on L5 and S1 frequencies are extracted from the RINEX data. The ionospheric delay on L5 is estimated using code measurements and carrier-phase measurements following the standard equations [6]. The noisy code-based estimates of delay are smoothed using carrier phase-based estimates. The resulting smoothed estimates of delays are slant delays and converted to vertical delays by multiplying with standard Obliquity Factor [7]. The gradients of vertical ionospheric delays are computed using Time-Step method and Station-Pair method.

### A. Time-step method

In this method, the difference of the vertical ionospheric delays experienced by given satellite-receiver pair ‘X’ at two distinct epochs of time ( $Id_{x,t_1}^v - Id_{x,t_2}^v$ ) is divided by the corresponding ionospheric Pierce Point (IPP) separation distance ( $d$ ) to obtain the gradient of vertical ionospheric delay ( $VIG_{x,t_1,t_2}^v$ ).

$$VIG_{x,t_1,t_2}^v = \frac{|Id_{x,t_1}^v - Id_{x,t_2}^v|}{d} \quad (1)$$

IPP latitude and longitude are computed using standard equations [8]. The time-interval ( $\Delta t = t_1 - t_2$ ), can be chosen and varied in order to vary the IPP distance and thereby obtain gradients over the area of interest.

### B. Station-Pair method

In this method, difference of vertical ionospheric delays ( $Id_{a,t_1}^v - Id_{b,t_2}^v$ ) experienced by a pair of stations ( $R_{a,t_1}$ ,  $R_{b,t_2}$ ) is divided by the IPP distance ( $d$ ) between the stations to estimate the Vertical Ionosphere Gradients ( $VIG_{a,b,t_1,t_2}^v$ ).

$$VIG_{a,b,t_1,t_2}^v = \frac{|Id_{a,t_1}^v - Id_{b,t_2}^v|}{d} \quad (2)$$

The gradients are computed for all the IRNSS satellites for several days using these two techniques (Eqns. 1 and 2). However, results due to IRNSS 1B on a typical day (15 May 2017) ( $1 < Kp < 5$ ) are presented here.

# Design and Implementation of Low Noise Amplifier (LNA) for IRNSS Receiver

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**Abstract**—The Low Noise Amplifier (LNA) is the important design in the receiver architectures. Amplification is one of the most basic functions in modern RF and microwave systems. In order to amplify the signal received from the antenna in a RF system, LNA is required. The main function of LNA is to amplify signals without degrading its Signal-to-Noise Ratio (SNR) at extremely low power levels. The front end of any receiver is typically a LNA, whose function is to provide enough gain to overcome the noise of subsequent stages. Aside from providing this gain while adding as little noise as possible, an LNA should receive large signal without distortion and frequently must also present specific impedance, such as 50Ω to the input source. As the present LNA's have the Noise Figure greater than 6dB and the consumption of power is more. The following paper illustrates the design of an LNA for Noise Figure  $\leq$  4dB and Forward Gain  $\geq$  10dB.

**Keywords**—LNA, Narrow Band, RF Front End.

## I. INTRODUCTION

Wireless Operations permit services, such as long range communications that are impossible and impractical to implement with wires. The rapid increase of wireless services and other telecom applications has forced the semiconductor industry towards complete system-on-chip solutions. As we know wireless systems comprise of a front-end and a back-end section. The front-end section consists of all the filters, Low Noise Amplifiers (LNA's), down to conversion mixers and processes analog signals in the high Radio Frequency (RF) range while the back-end section processes analog and digital signals in the low frequency range. The band of Radio Frequency (RF) in the electromagnetic spectrum is from 100 KHz to 100 GHz and this band is used for radio communication.

In general, the frequencies less than 1GHz are represented as baseband frequencies while those greater are described as RF. The process of analog signals in RF circuits must be done with a considerable dynamic range of high frequencies. The received RF signal from the antenna contains noise as the signal travels in air which acts as wave guide and this makes the signal weak. So we need to amplify the RF signal for further subsequent stages. Therefore, an amplifier with a high gain and good performance in noise is needed to amplify the signal before it can be fed to other parts of the receiver. Such an amplifier is mentioned as a Low Noise Amplifier (LNA)

and forms an essential component of any RF integrated circuit receiver. The performance of receiver depends on Low noise amplifiers (LNA's) because the signal which is received contains noise which represents the amplifier noise and this noise should be minimized. As the received signal might be very weak due to propagation of signal in air, an LNA is used to amplify the signal and the noise associated with the signal. The total noise performance of the receiver depends on the Gain and Noise Figure of the Low Noise Amplifier (LNA), as can be seen from the Friss formula. As defined by IEEE, L band is from 1 to 2 GHz range of radio spectrum. This frequency band is widely used for Indian Regional Navigation Satellite System (IRNSS) applications.

IRNSS is an independent regional navigation satellite system being developed by India. It is designed to provide accurate position information service to users in India as well as the region extending up to 1500km from its boundary, which is its primary service area. An Extended Service Area lies between primary service area and area enclosed by the rectangle from Latitude 30° South to 50° North, Longitude 30° East to 130° East. IRNSS will provide two types of services, namely, Standard Positioning Service which is an encrypted service provide only to the authorised users such as defence and military.

## II. LOW NOISE AMPLIFIER

### A. Topology

The primary stage in the RF receiver design is Low Noise Amplifier (LNA). The frequency of operation of an Low Noise Amplifier (LNA) is in RF frequency band, the circuit should be as flexible as possible, especially for the RF path. Otherwise, if the circuit path is too complicated, the noise of the circuit becomes too high. If the noise is too high the Signal to Noise ratio of the system degrades. Therefore, the parasitic effects may distort the amplified signal. In order to prevent these effects, there are several fundamental Low Noise Amplifier (LNA) topologies for single ended narrow band low power low voltage design, such as resistive termination common source, common gate, shunt series feedback common source, inductive degeneration common source, cascode inductor source degeneration. There are techniques in topologies for Low Noise Amplifier (LNA) design.



# Indoor Propagation of IRNSS Signals: Preliminary Results

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**Abstract**— With latest technologies most of the smart devices are expected to work in all types of environments including indoor scenarios. But, conventional Global Navigation Satellite System (GNSS) receivers when used in indoor environments face difficulty in dealing with the propagating signals, hence channel modeling of signals in indoor is necessary. In this paper, experiments are carried out using IRNSS S1 and L5 signals at three indoor locations to compare their performance with the corresponding outdoor locations only differed by altitude. The experimental environment and effect of signal obstructions are explained using C/N<sub>0</sub> and system specifications. The results would be useful in designing indoor applications of IRNSS.

**Keywords**— Indoor propagation, IRNSS, S1 Band, L5 Band

## I. INTRODUCTION

Indoor positioning systems are becoming more popular because of increasing number of electronic devices and applications relating to telecommunications and Internet-of-Things (IoT). System designers need to understand the effects of various environments on the propagating signals. The statistics of propagation effects keeps on changing with respect to the size, shape and construction materials of the building and operating frequency. Several models are designed and developed for characterizing the signals in indoor scenario [1-2]. Limited work has been done to statistically characterize the propagation effects inside the buildings for signals in the frequency range of 800 MHz to 5.8 GHz with respect to satellite signal applications [3]. Indian Regional Navigation Satellite System (IRNSS) S1 signals are new for satellite applications, thus investigation of IRNSS S1 and L5 band signals in indoor and outdoor environment is interesting. This work investigates the IRNSS S1 band signal behavior and compares with L5 band signal in a particular indoor/outdoor environment. For this, we have performed several experiments in indoor and outdoor scenarios.

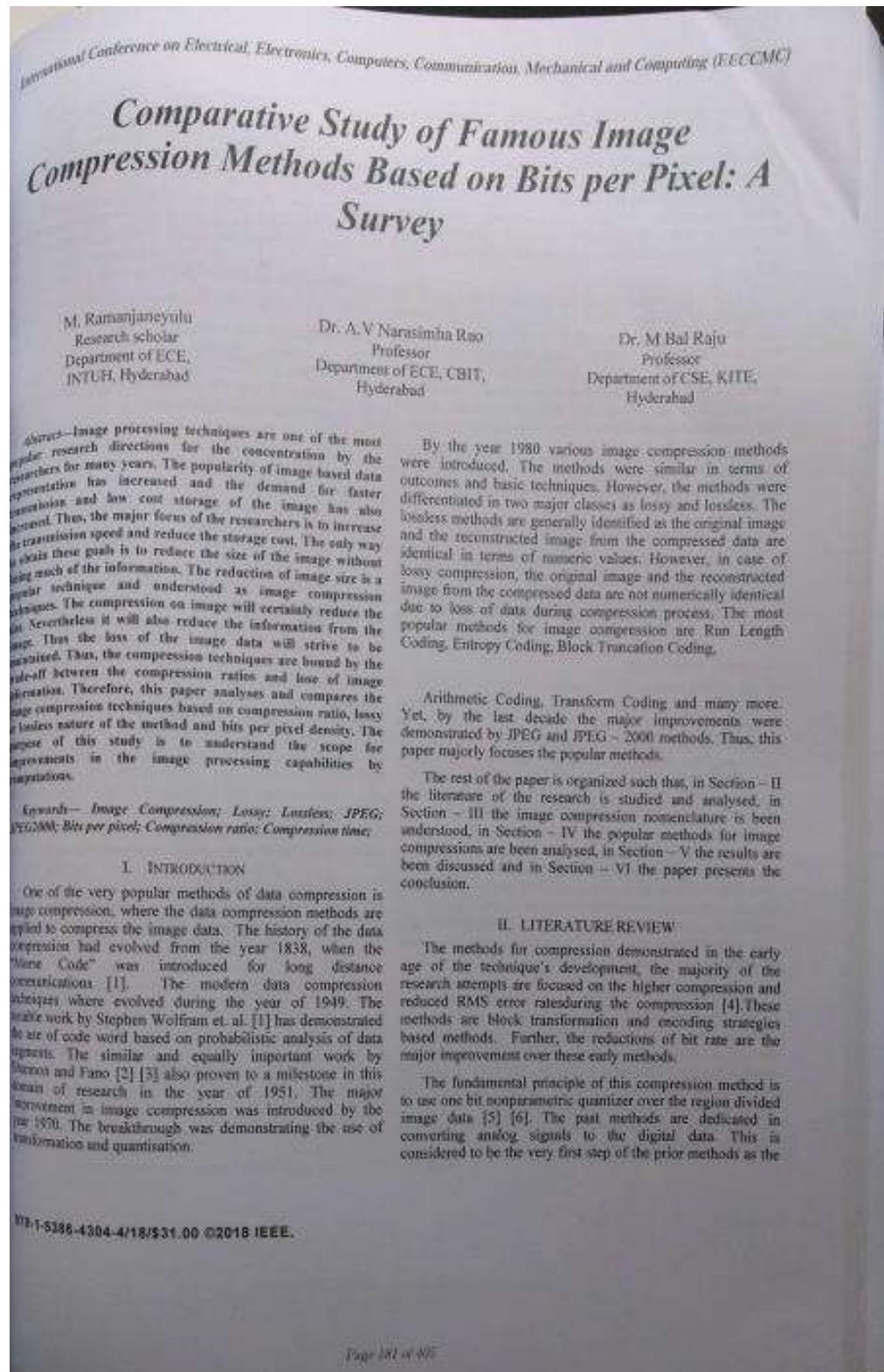
## II. IRNSS

Indian Regional Navigation Satellite System (IRNSS) is India's own regional independent navigational satellite system. The constellation consists of three Geo Stationary (GEO) and

four Geo Synchronous (GSO) satellites. The IRNSS is expected to provide the positional accuracy of 10m over Indian landmass under open sky environments. The satellite navigation system has several applications and the positional accuracy of IRNSS can be further improved by using latest error modelling techniques [4-5]. Under a Memorandum of Understanding (MoU) with Space Application Centre (SAC), Indian Space Research Organization (ISRO), Ahmedabad, IRNSS receiver was installed at CBIT, Hyderabad, (17.39°N, 78.31°E). The receiver data is stored in two different formats, namely, raw data and NMEA data. Raw data is a binary file that can be converted to the two data formats Receiver Independent Exchange (RINEX) and Comma Separated Value (CSV) format. The user can convert the CSV files into different spreadsheet programs. The files contain several parameters including 3D RMS user position (ECEF), satellite position (elevation, azimuthal in degrees) and signal strength (dB-Hz). Minimum operating received Carrier to Noise Power (C/N<sub>0</sub>) for both S1 and L5 signals is 28 dB-Hz. Signal acquisition sensitivity is -165dBW. Receiver self-error contribution is very nominal and is approximately <math>-0.15\text{m}</math> at C/N<sub>0</sub> > 42dB-Hz [6]. Frequency tracking range is  $\pm 10$  KHz.

## III. INDOOR PROPAGATION MODELS

For better designing of systems, understanding of the indoor propagation characteristics of a radio wave signal in terms of channel model is required. For indoor applications, several path loss models are available in the open literature. Prominent among them are: Motley and Keenan model [7], Scott model [8], Partition Attenuation Model [9-10] and Log-Distance or Log-Normal shadowing model [12]. Each one of these models has certain benefits and drawbacks. For example, Motley Kenn Model has worked on multifloor environment. Signal strength, transmitting antenna and receiving antenna power levels are important considerations for this model and it is a general model without considering wall attenuations. Similarly, Pechev and Klepal has developed Partition Attenuation model, which is useful for successfully modelling the WLAN systems in 2.4GHz ISM Band. But these systems are highly dependent on average signal strength in a specific location and also on fading statistics.



# Comparative Study of Famous Image Compression Methods Based on Bits per Pixel: A Survey

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**Abstract**—Image processing techniques are one of the most popular research directions for the concentration by the researchers for many years. The popularity of image based data representation has increased and the demand for faster transmission and low cost storage of the image has also increased. Thus, the major focus of the researchers is to increase the transmission speed and reduce the storage cost. The only way to obtain these goals is to reduce the size of the image without losing much of the information. The reduction of image size is a popular technique and understood as image compression techniques. The compression on image will certainly reduce the size. Nevertheless it will also reduce the information from the image. Thus the loss of the image data will strive to be minimized. Thus, the compression techniques are bound by the trade-off between the compression ratios and loss of image information. Therefore, this paper analyses and compares the image compression techniques based on compression ratio, lossy or lossless nature of the method and bits per pixel density. The purpose of this study is to understand the scope for improvements in the image processing capabilities by comparison.

**Keywords**— Image Compression; Lossy; Lossless; JPEG; JPEG2000; Bits per pixel; Compression ratio; Compression time;

## I. INTRODUCTION

One of the very popular methods of data compression is image compression, where the data compression methods are applied to compress the image data. The history of the data compression had evolved from the year 1838, when the “Morse Code” was introduced for long distance communication [1]. The modern data compression techniques were evolved during the year of 1949. The classic work by Stephen Wolfram et. al. [1] has demonstrated the use of code word based on probabilistic analysis of data segments. The similar and equally important work by Shannon and Fano [2] [3] also proven to a milestone in this domain of research in the year of 1951. The major improvement in image compression was introduced by the year 1970. The breakthrough was demonstrating the use of transformation and quantisation.

By the year 1980 various image compression methods were introduced. The methods were similar in terms of outcomes and basic techniques. However, the methods were differentiated in two major classes as lossy and lossless. The lossless methods are generally identified as the original image and the reconstructed image from the compressed data are identical in terms of numeric values. However, in case of lossy compression, the original image and the reconstructed image from the compressed data are not numerically identical due to loss of data during compression process. The most popular methods for image compression are Run Length Coding, Entropy Coding, Block Truncation Coding,

Arithmetic Coding, Transform Coding and many more. Yet, by the last decade the major improvements were demonstrated by JPEG and JPEG - 2000 methods. Thus, this paper majorly focuses the popular methods.

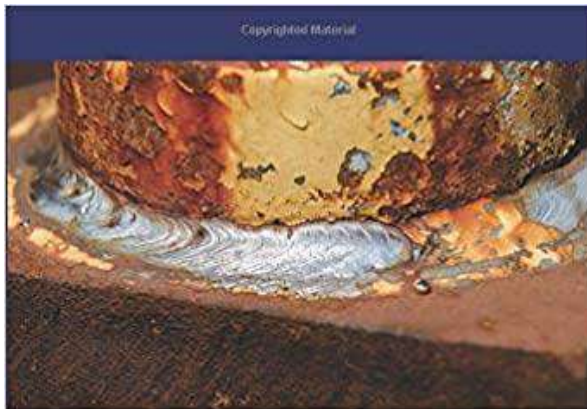
The rest of the paper is organized such that, in Section - II the literature of the research is studied and analysed, in Section - III the image compression nomenclature is been understood, in Section - IV the popular methods for image compressions are been analysed, in Section - V the results are been discussed and in Section - VI the paper presents the conclusion.

## II. LITERATURE REVIEW

The methods for compression demonstrated in the early age of the technique's development, the majority of the research attempts are focused on the higher compression and reduced RMS error rate during the compression [4]. These methods are block transformation and encoding strategies based methods. Further, the reductions of bit rate are the major improvement over these early methods.

The fundamental principle of this compression method is to use one bit nonparametric quantizer over the region divided image data [5] [6]. The past methods are dedicated in converting analog signals to the digital data. This is considered to be the very first step of the prior methods as the

# Friction Stir Welding of Magnesium Alloy AZ31B





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FSW is a joining process that employs a cylindrical shouldered tool with a probe (pin), rotates and plunges into the two consecutive parts of workpieces and furthermore traverses slowly along the joint line to produce weldment. The use of magnesium alloy as the structural material has been generally increasing in automobile, electronics and other industries due to many advantages such as light weight, high specific strength. In this book a detailed description of friction stir welding of Magnesium Alloy AZ31B is discussed. This book explains the how to add the silicon carbide and aluminium oxide as a reinforcement at weld interface to enhance the mechanical properties of welded portion. How to create the geometries for different volume proportions of reinforcement at weld interface is available. This book explains the relation between type of reinforcement, percentage of reinforcement by volume and mechanical properties of welded portion. How to perform the finite element analysis of reinforced and unreinforced friction stir welded joints is included. It gives the clear information of how to enhance the mechanical properties of friction stir welded joints of Magnesium Alloy AZ31B.

Md. Azeem Pasha

## Friction Stir Welding of Magnesium Alloy AZ31B



I have completed my B.Tech in Mechanical Engineering in 2004 from JNTU. I have done my Masters in Mechanical Engineering with specialization of CAD/CAM in 2010 and Ph.D in Mechanical Engineering on friction stir welding of Aluminium and Magnesium Alloys from Osmania University in 2017. Present I am working as Assistant professor at CBIT, Hyderabad



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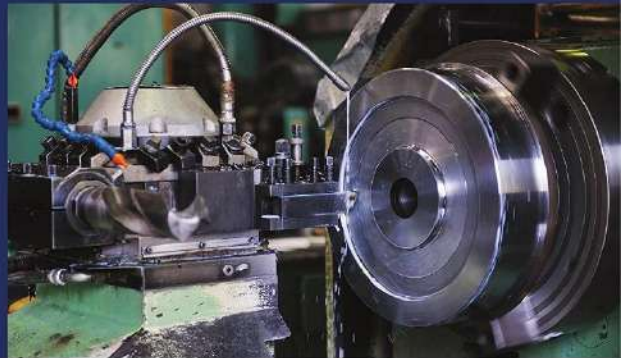
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## Friction Welding of Brass and statistical Modelling

FRICION WELDING is widely used for welding of similar and dissimilar materials. This book emphasizes on Industrial use of non ferrous materials as they are significant in the different engineering applications. Brass joints are inevitable for certain applications due to unique performances such as higher electric conductivity, heat conductivity, corrosion resistance and high strength but Joining of brass with friction welding is very difficult because it has low coefficient of friction. A detailed description of friction welding brass specimens is discussed. This book explains the effect of process parameters of friction welding on mechanical properties of welded portion. Design of experiments using taguchi technique is elaborately discussed and the usage of minitab software for statistical analysis and optimization is explained.



Md. Aleem Pasha



I have completed my B.Tech in Mechanical Engineering in 2004 from JNTUH. I have done my masters in Mechanical Engineering with specialization of CAD/CAM in 2010 and Ph.D in Mechanical Engineering on friction stir welding of Aluminium and Magnesium alloys from Osmania University in 2017. Present working as Assistant professor at CBIT, Hyderabad.

## Friction Welding of Brass and Statistical Modelling



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Reinforced and Unreinforced Friction stir welding of Aluminium Alloy 6061



Md. Aleem Pasha

# Reinforced and Unreinforced Friction stir welding of AA6061







## Reinforced and Unreinforced Friction stir welding of AA6061

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This book presents the enhancement of mechanical properties of friction stir welded portion of Aluminium alloy 6061 by incorporating additional reinforcing particulates of silicon carbide and aluminium oxide at weld interface. Silicon carbide and aluminium oxide has been added as reinforcement by creating separate geometry, at the edges, where the welding is interface with four different volume proportions such as 10%, 15%, 25% and 30%. Tool steel of H13 grade is used as friction stir welding tool. Quality assessment is carried out by visual inspection and non-destructive testing using florescent and radiography to reveal the surface and volumetric defects. Mechanical testing including tensile test, impact test, bend test and hardness test were conducted to study the behavior of reinforced and un-reinforced friction stir welded joints. Metallurgical evaluation has been performed by capturing the microstructures of base materials and at different zones of nugget, heat affected zone (HAZ) by optical microscope to reveal the grain size and grain refinement at different zones. Finite element analysis has been carried out by ANSYS software to know the temperature distribution.

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**Strengthening and Joining by Plastic Deformation** pp 163–182

## SiC and Al<sub>2</sub>O<sub>3</sub> Reinforced Friction Stir Welded Joint of Aluminium Alloy 6061

[Md. Aleem Pasha](#) , [P. Ravinder Reddy](#), [P. Laxminarayana](#) & [Ishtiaq Ahmed Khan](#)

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### Abstract

This research presents the enhancement of mechanical properties of friction stir welded portion of aluminium alloy 6061 by incorporating additional reinforcing particulates of silicon carbide and aluminium oxide at weld interface. Friction stir welding (FSW) of AA6061, each plate of 200 mm × 100 mm × 4 mm thickness with silicon carbide and aluminium oxide as reinforcement at weld interface in four different volume proportions and without reinforcement are performed on vertical milling machine. In the present research, comparison has

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# Experimental investigation on utilization of RCA in low, medium and high strength self-compacting concrete

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## Experimental investigation on Utilization of RCA in Low, Medium and High Strength Self Compacting Concrete

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**Abstract.** Self Compacting Concrete (SCC), owing to its advantages, is now a buzz word in the present construction industry. The application of recycled aggregates in concrete mixes is widely investigated. The present investigation focuses on the use of RCA in SCC. The variables of study include grade of concrete (Normal, standard grade and high strength), RCA content (0 to 100%) and age of concrete (7 and 28 days). The parameters of investigation are fresh and hardened state properties, viz. compressive, split tensile and flexural strengths. The mix design was carried out based on modified Nan Su method. The fresh state properties were satisfied for all RCA contents in all the three grades of concretes tested. The test results were encouraging and the target mean strength could be attained in M30 concrete even with 50% RCA as replacement of natural aggregate. However, a reduction in strength was observed as the grade of concrete increased. Optimum RCA content was arrived at based on the strength for different grades of concretes tested.

### 1. Introduction

The experimental investigations on the recycling of Construction and Demolition Wastes have long been accepted to have the possibility to conserve natural resources and to decrease energy used in production. In some nations it is a standard substitute for both construction and maintenance, particularly where there is a scarcity of construction aggregate. Researches on Construction and Demolished Waste (CDW) reveal that the behaviour of structural concrete with recycled aggregate is comparable to that of the concrete with conventional natural aggregate Manzi et al. [1,2] (2013). The use of such materials solves the disposal problem, apart from reducing the cost of construction materials.

The Indian construction industry today is amongst the five largest in the world and the supply of natural aggregate has also emerged as a problem in some of the metropolis in India. The requirement of natural aggregates is not only required to fulfil the demand for the upcoming future projects in India but also the needs of extensive repairs or replacements required for the existing infrastructure. The future of construction industry sector seems to be in dark with the likely shortage of natural resources as seen today. Several market constraints and technical challenges exist when developing markets for new products. Notable among these barriers is consumer uncertainty about the quality and consistency of products due to the lack of practical performance and engineering data on recycled materials A.R.Khaloo, et al. [3-5] (1996). Such data is necessary to assist with the development of appropriate design codes to guide product specification and performance information on recycled materials.

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## Bond Strength of HYSD Bars and SCC with and without Recycled Aggregate-An Experimental Study

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**Abstract.** Self Compacting Concrete (SCC) has become inevitable in the current scenario of construction of large and complex structures with heavy reinforcement and complicated shapes. Using normal concrete in such situation may often result in inadequate compaction, affecting performance and long-term durability of structures. In addition, the use of Recycled Concrete Aggregate (RCA) is gaining importance throughout the globe due to the depleting sources of natural aggregate and disposal problem of demolished waste. There is a little work done on the behaviour of SCC with RCA. Therefore, a comprehensive experimental investigation on bond strength and modes of failure of Self Compacting Concrete (SCC) with and without Recycled Concrete Aggregate (RCA) was carried out and the results are presented. The variables studied include grade of concrete (M20, M40 and M60), Percentage of RCA (0% to 100%), diameter of bar (10, 12 and 16) and percentage embedment length. All specimens were tested by conducting pull out test on UTM after 28 days of curing. The bond strength was found to vary with the increase in diameter and the failure mode was observed to change from rod pull out to splitting or rod fracture with increase in percentage of embedment length. The experimental results were compared with the theoretical bond strengths using the authors' formula and the formulae suggested by earlier researchers.

### 1. Introduction

The concept of sustainability is widely used in the construction industry due to the concern about the future of the planet as this industry consumes huge quantities of natural resources. There has been considerable research carried out on the use of recycled aggregates in concrete over the past 20 years, and this has grown extensively over the past five years as industry and Government have recognised the need for greater sustainability in construction. Research has shown that coarse recycled aggregates can be used in concrete up to a compressive strength of 80 MPa although there is a loss in strength when recycled aggregates are used as a direct replacement of natural aggregate. However, most researchers report that a certain proportion of coarse recycled aggregates (usually in the range 20-30% by mass of coarse aggregate) can be added as partial replacement to natural aggregate without affecting performance. The reason for the loss in strength is usually associated with the weaker interfacial transition zone between aggregate and mortar, due to recycled aggregates having a coat of weak mortar already attached which raises the porosity of the concrete. In general, the flexural strength and modulus of elasticity of recycled aggregate concrete have been reported to be proportional to the loss of compressive strength.

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## Study on Mechanical Properties of Recycled Coarse Aggregate Concrete with Stone Dust

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**Abstract** - In the recent times, usage of recycled coarse aggregate (RCA) as replacement of natural aggregate in concrete is gaining popularity all over the world. In the process of preservation of the environment and sustainable development, recycled coarse aggregate (RCA) is playing a major role in the construction industry. RCA is obtained by crushing the construction rubble obtained from demolished structures. Many countries are giving many infrastructural laws relaxation for increasing the use of recycled aggregates. River sand is most commonly used fine aggregate in the production of concrete. Using river sand in large quantities poses the problem of acute shortage in many areas. In this regard, stone dust can be an economic alternative to the river sand. In the present study mechanical properties of the recycled coarse aggregate concrete with stone dust are compared with that of conventional concrete made of natural aggregates and river sand. M20 and M30 grades of concrete are designed as per IS 10262-2009 and IS 456-2000. Tests were conducted on cubes, cylinders and prisms to study the strength of concrete made of stone dust and recycled aggregate. Recycled coarse aggregate (RCA) used in this work is obtained from crushing old tested concrete cubes to replace the natural coarse aggregates (NCA) in different proportions. Experiments were conducted using 0%, 30%, 60%, 90% replacement of natural coarse aggregate with recycled coarse aggregate and 0%, 50%, 100% replacement of fine aggregate with stone dust. Concrete specimens were tested after 7 and 28 days of curing. Results shows that the concrete with 100% stone dust and upto 60% recycled coarse aggregate qualifies as a substitution of conventional concrete

**Keywords:** Recycled aggregate, stone dust, compressive strength, split tensile strength and flexural strength.

### I. INTRODUCTION

In the world of construction, concrete, like other materials is playing an important role in development. Concrete is a composite material which is a mixture of cement, fine aggregate, coarse aggregate and water. The major constituents of which is natural aggregate such as gravel, sand, alternatively, aggregates such recycled aggregate, manufactured sand furnace slag, fly ash, expanded clay, broken bricks and stone dust may be used where appropriate. It has many advantages including low cost, general availability of raw material, adaptability, low energy requirement and utilization under different environmental conditions. It is most common practice in all over the world that most of the materials are being recycled to save the natural resources and environment. Concrete is such a costly material but waste concrete is only being used as a landfill material instead of recycling the concrete as a recycled concrete aggregate (RCA) to use for the construction purposes. There is need to improve its properties like workability, strength and durability. The research has been executed in order to utilize smaller quantities of fine aggregate and coarse aggregate, also to conserve our natural resources and reduce the cost of construction. The goal of sustainable construction is to reduce the environmental impact.

### II. LITERATURE REVIEW

Mamey Serifou, et al., (2013) It is observed that the compressive strength decreases gradually with increase of the percentage of recycled aggregates. This relationship can be approximated by a polynomial function with  $R^2=0.92$ . The substitution of natural aggregates with 25%, 50%, and 100% of recycled aggregates decreases the compressive strength by about 15%, 25%, and 32%, respectively. The decrease in tensile strength is by 18% when 100% of the recycled aggregates are incorporated.

# Seismic Response Study of Multi-storied Reinforced Concrete Building with Fluid Viscous Dampers

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## Seismic Response Study of Multi-Storied Reinforced Concrete Building with Fluid Viscous Dampers

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**Abstract**-Damping plays an important role in design of earthquake resistant structures. It reduces the response of the structure when they are subjected to lateral loads. There are many different types of dampers in use. In the present study Fluid Viscous Dampers (FVD) are used to evaluate the response of RC buildings. One of the important properties of structure is to receive the effect of lateral loads and transfer it to the foundation. Since the lateral loads acting on a structure due to earthquake are dynamic in nature, they cause vibrations in it. In order to handle these vibrations, fluid viscous dampers are used in the design of earthquake resistant structures. In this study, structures of square and rectangular shaped floor plan with columns of square and rectangular shaped cross-sections are analyzed. ETABS 2015 software is used for finding the response of the structures with and without FVD by performing push over and time history analyses. It is observed that the performance of the structures with square columns is better in terms of response when compared to the structures with rectangular columns irrespective of the shape of floor plan. In Time History analysis, up to 90% decrease in the time period is observed when FVD's are used. FVD-250 reduced the base shear of the structures by 70%. Displacements of top storey are minimized by 90% with the use of FVD's. Hence FVD's can be used in RC multistoried structures to reduce the response effectively.

**Keywords:** Earthquake resistant structures, Fluid Viscous dampers (FVD), ETABS, push over analysis and time history analysis.

### I. INTRODUCTION

The viscous fluid dampers (VFD) are used to control response of the structures. They are used based on different construction technologies in order to decrease the structural response due to the seismic excitation. The devastating effects of the recent earthquakes such as Northridge earthquake (1994), Kobe earthquake (1995), and Taiwan earthquake (1999) on the buildings of cities adjacent to fault and with regard to the close location of many of the cities of India to the active faults indicate the significance of the research.

In last few years, many essential developments in seismic codes have turned up. Seismic isolation and energy dissipation are widely recognized as effective protection techniques for reaching the performance objectives of modern codes. However, many codes include design specifications for seismically isolated buildings, while there is still need of improved rules for energy dissipation protective systems. [1]

### II. LITERATURE

Y. Zhou, et al. 2012 [2] "A practical design method for reinforced concrete structures with viscous dampers" shown how compared to the retrofitting technology of seismic isolation, the installation of viscous dampers to those existing buildings are more realistic because of easy construction. However, the design of viscous dampers, which provides a high level of damping in a structure, was relatively new application in China for a well-established and proven technology in other seismically active regions in the world.

V. Umachigi, et al. 2013, [3] "Applications of dampers for vibration control of structures: An overview" has briefly explained that viscous dampers works based on fluid flow through orifices. Viscous damper consists viscous wall, piston with a number of small orifices, cover filled with silicon or some liquid material like oil, through which the fluid pass from one side of the piston to the other.

Liya Mathew & C. Prabha, 2014, [4] published "Effect of fluid viscous dampers in multi-storied buildings" in which they mentioned that special protective systems have been developed to enhance safety and reduce



## ***Power Quality Improvement using Custom Power Devices (AVC, DVR, APC)***

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**Abstract**—Power Quality exertion has happen to more complex at all stages of power system. Nowadays a new concept of custom power is used for customer's satisfaction. This paper presents a wide-ranging survey of custom power devices in order to get better quality of power. Custom power devices (CPDs) with DVR, AVC and APC be replicated on the customized IEEE 16 bus radial division scheme by Matlab to examine efficiency of every device in a variety of PQ disorders together with voltage sags, harmonic distortions and voltage disturbance. Results of this work show that the application of every apparatus to recompense dissimilar PQ disorders depend on the device's features.

**Keywords**— Active voltage conditioner, Dynamic voltage restorer, Active power Conditioner, Custom power devices, Power quality, Power quality disturbance.

### I. INTRODUCTION

As per consistency deliberation in power system generation unit must spawn acceptable quantity of power, transmission unit should provide highest power to each consumer's location form immensity power systems. Distribution system is situated at the end of consumer. The reason for this is fall down in the electric distribution network accounts for about 91% of the average consumer's intrusion. Earlier, power system consistency decisive on generation and transmission. But today, distribution system is receiving more attention as dependability is anxious. Power quality issues are achieving a chief anxiety due to the augment in number of responsive loads. Also the wide-ranging service of information technology equipment, adjustable speed drives (ASD), arc furnaces, electronic fluorescent lamp ballasts and programmable logic controllers (PLC) have entirely altered the exciting masses scenery. These masses are the foremost sufferers of power quality trouble. the non-linearity of these loads cause disturbances in the voltage waveform. The utility will likely to deliver a low deformation unbiased voltage to its consumers, particularly those with responsive loads. For the enhancement of reliability and power quality of system, the custom power devices are introduced into the power system. DVR, AVR, APC etc. are some of the major

devices used for the improvement of voltage sag and swells. With the help of these FACTS devices[12], we are competent of decrease the trouble related to power quality.

This document presents a swot on the most popular CPDs[1] counting AVC, DVR, APC under unlike PQ conflict. every tool is modelled on the adapted IEEE 16-bus [2] radial circulation scheme using Matlab. Numerous PQ issues are generated for investigation and compared.

### II. POWER QUALITY DISTURBANCES

Electricity consumers face power quality problem at all stages of usage. Actually, Power quality[3] defines the assets of power supply distributed to the user in standard working conditions. New electronic equipments and devices are more prone to power quality problems[10,11]. Reduced PQ has become a major problem for both power suppliers and customers. Poor PQ means there is enough variation in the power supply to affect equipments and may lead to their mis-operation or failure. It is unfeasible to entirely manage conflict on the delivery scheme but labours and hoard are made by utilities to avoid interruption. standard operation for instance switching loads and capacitors or faults and opening of circuit breakers to apparent faults mainly cause disturbances. significant PQ issues those need realistic solutions are explained below:

#### *A. Voltage Sag or Dip*

Voltage sag Fig.1 is defined as a drop in the regular voltage stage linking 10 and 90% of the supposed rms voltage at the power incidence, for durations of 0.5 cycle to 1 minute. It is clear from Fig.1 that voltage sag reduces the scale of voltage. association of heavy loads, activate of huge motors and faults in consumer's installation are the main reasons for voltage sag. initial of bulky induction motors can result in voltage dip as the motor draw a current up to 11 times the full load current throughout the starting. The Consequences of voltage sag are separation and loss of competence in electric revolving equipment, tripping of electro-magnetic relays and break down of in sequence knowledge apparatus namely micro-processor based control systems.



## **Multi-Objective Optimal Power Flow with Generalized Interline Power Flow Controller using NSHCSA**

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**Abstract**— A novel power injection model based on voltage sources for the latest multi-line controller namely, Generalized Interline Power Flow Controller (GIPFC) is proposed. The complete modeling is performed in two stages, one is for series voltage sources and the other is for shunt voltage source. In this modeling the switching losses of the converters are considered. The most commonly used power system objectives namely generation fuel cost along with device investment cost of IPFC and GIPFC, emission and total transmission power losses are optimized individually and as well as simultaneously while satisfying equality, in-equality, device constraints and practical constraints. For this, a new evolutionary algorithm by combining Genetic Algorithm (GA) along with Cuckoo Search Algorithm (CSA) is implemented as Hybrid Cuckoo Search Algorithm (HCSA) to improve the convergence characteristics of the single objective optimization problem and along with this a Non-dominated Sorting Hybrid Cuckoo Search Algorithm (NSHCSA) is proposed for multi objective optimal power flow problem. The proposed methodology is tested in standard IEEE-30 bus system with supporting numerical results.

**Keywords**— *Generalized Interline Power Flow Controller; Power Injection Model; Ramp-rate limits; Prohibited Operating Zones; Non-dominated Sorting.*

### I. INTRODUCTION

Latest development in FACTS technologies, two or more series and shunt converter combination devices are used to form the hybrid FACTS device. In [1] the basic topology and working principle of Generalized Interline Power Flow Controller (GIPFC) are discussed. GIPFC model is developed by using d-q coordinates for controlling the direct and quadrature components of the ideal source converters in [2]. In this [3], a newly surfaced nature-inspired optimization technique called moth-flame optimization (MFO) algorithm is utilized to address the optimal reactive power dispatch (ORPD) ...

other objective is compromised Optimal Power Flow (MO-OPF) problem has been formulated in [5] paper. Swarm Intelligence methods, such as Particle Swarm Optimization (PSO) and Glowworm Swarm Optimization (GSO) have been used to solve the OPF problem with generation cost and emission minimizations as objective functions.

Further, on observation it is revealed that the power injection model (PIM) of FACTS devices is a powerful model than other models [6, 7]. A steady state control of power system parameters with current and voltage operating constraints has been presented by X.P.Zhang [8] in which it uses a multi control functional model of SSSC.

Mathematical models of generalized unified power flow controller (GUPFC), IPFC and their implementation in Newton power flow are described by X.P.Zhang [9] to demonstrate the performance of GUPFC and IPFC.

S. Teerathana et al. [10] proposed OPF method with IPFC to solve load flow problem and the power and the power generation with the minimum cost. An injection model for congestion management and total active power loss minimization in electric power system was developed Jun Zhang and Akihiko Yokoyama [11]. Suman Bhowmick et al. [12] have given an indirect unified power flow controller model to enhance reusability of Newton power flow codes. A current based model of static synchronous series compensator (SSSC) and interline power flow controller (IPFC) has developed by Vinkovic A and Mihalic R [13, 14].

In this paper presents the power injection model of GIPFC. To prove the effectiveness of the device, considered objectives are optimized individually and simultaneously by satisfying the equality, inequality, device and practical constraints. In this a novel optimization technique hybrid cuckoo search algorithm is proposed by combining basic cuckoo search algorithm with GA based crossover operation. Same

# Simulation and Analysis of Single Phase Full Bridge Diode Rectifier with Different Passive Power Factor Correction Techniques

International Conference on Recent Innovations in Electrical, Electronics & Communication Engineering - (ICRIEECE)

## Simulation and Analysis of Single Phase Full Bridge Diode Rectifier with Different Passive Power Factor Correction Techniques

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**Abstract**— It is needless to say that many industrial applications invariably demand DC power supply. As AC power is abundantly available it is economical to convert it into DC and to use for industrial loads. Converter circuitry being fabricated with solid state components, the supply gets distorted with the harmonics injected. This problem can be overcome by placing proper passive filters in the input side which is evident from simulation analysis carried out in this paper by using different techniques. The entire analysis is carried out in MATLAB/SIMULINK environment.

**Keywords**—single phase diode bridge rectifier, capacitive filter, passive power factor correction technique, THD

### I. INTRODUCTION

For control of electric power it is required to convert power from one form to other form. As AC power more cheaper than DC power, so available AC power is converted to DC by using rectifiers. These rectifiers are part of many industrial applications. At low power levels, the application is in the area of computers, air-conditioning etc. At high power levels the application is in AC to DC drives. The output obtained from these drivers are given as input to inverters. Traditionally single phase AC-DC converters are developed by using diodes and thyristors to provide controlled and uncontrolled, unidirectional and bidirectional DC power. These rectifiers suffer from problems such as poor power quality in terms of current harmonics, voltage distortions, poor power factor, low efficiency at input ac mains. Various filters are used at input side and output side to reduce the ripple content in DC output, to improve efficiency, to reduce harmonics in Line current[1]

In this paper a Single-phase full bridge diode rectifier with capacitive filter and its drawbacks are analysed and techniques used to overcome the problems of capacitive filter are studied and simulated in MATLAB/SIMULINK.

### II. CONVENTIONAL 1- $\phi$ FULL BRIDGE DIODE RECTIFIER

Single phase diode rectifier with R-Load is shown in Fig-1. It consists of 4 diodes D1, D2, D3, D4. During positive half cycle of supply voltage the diodes D1, D2 conducts and during negative half cycle the diodes D3, D4 conducts and its voltage and current waveforms are shown in Fig-2. It is observed from waveforms for both positive and negative cycles current flows through load is unidirectional. The ripple frequency is twice the supply frequency. The Peak Inverse Voltage (PIV) of the diode is  $V_m$ . The output voltage of Rectifier contains ripples i.e it contains both AC and DC components. These AC components are undesirable due to which efficiency reduces. So in order to minimize ripple content filters are used, which leaves DC component to appear at output. Some important filters are capacitor, inductor, combination

of capacitor and inductor. In most of industrial applications single phase diode rectifier with capacitive filter is used at input stage as it is cost effective solution and highly reliable in low power ranges[2]

The average output voltage  $V_o = \frac{2 \times V_m}{\pi}$  (Volts)

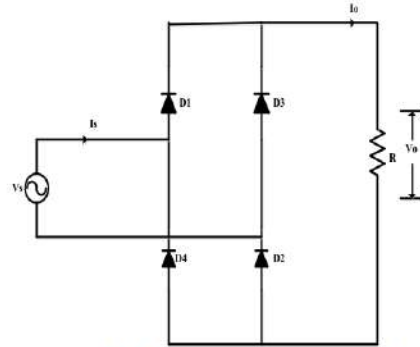


Fig-1: 1- $\phi$  Full bridge diode rectifier without filter

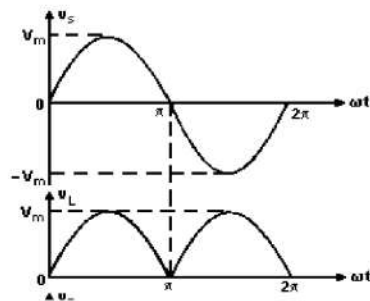


Fig-2 waveforms for rectifier without filter

### III. SINGLE PHASE FULL BRIDGE DIODE RECTIFIER WITH CAPACITIVE FILTER

The rectifier without filter produces ripples due to which efficiency and power factor are low. So in order to reduce ripples in the output, some of the energy is stored in capacitor and is allowed to discharge during pulses. Fig-3 shows the single phase full bridge diode rectifier with capacitive filter. It is observed from Fig-3 a large capacitor is placed directly across the load terminals. The pulsating voltage from the rectifier without filter as shown in Fig 2 is applied to this capacitor. As we know that capacitor will

Modeling and simulation of dual Redundant power inverter stage to BLDCM for MEA  
Application





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## Modeling and Simulation of Dual Redundant Power Inverter Stage to BLDCM for MEA Application

[B. Suresh Kumar](#), [B. V. Ravi Kumar](#) & [K. Sindhu Priya](#) 

Conference paper | [First Online: 08 February 2019](#)

**624** Accesses

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### Abstract

The increasing demand for electrification functions on control surfaces of aircraft leads to a new concept of new advancement “more electric aircraft (MEA)”. In the aviation industry, an electromechanical actuator (EMA) is used to maintain the orientation of aircraft, landing gears, and braking systems. As the electrical components such as inverter and BLDC motor are key components in EMA, the designing of these components became a critical issue. To enhance the reliability in actuation system in aircraft, this paper proposes dual redundant power inverter system to

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# A New Technique for Designing Restoration Based Reliable WAMS Structure

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**Abstract**—Wide-Area Measurement System (WAMS) plays a significant role in recovering the historical data for power system post-mortem analysis. For this purpose, the paper presents a new methodology for partitioning a WAM network into number of WAMS regions. It enables restoration process easier. Later, it also suggests a reliable placement of Phasor Data Concentrators (PDCs). For this, transformer equivalent bus constraint, generation-load balance and observability constraints are considered. An IEEE-30 bus system is used for demonstrating the proposed scheme.

**Keywords**—Power system Restoration, PMU, Reliability, PDC, WAMS.

**Nomenclature:**

$S_p$ : observability function for bus  $p$ ,  $S_p > 1$ .

$c_{pq}$ : Binary connectivity parameter.

$r$ : the total number of regions.

$n_r$ : the number of buses in each island,

$P_{Gi}$ : The maximum generation at  $i^{\text{th}}$  bus

$P_{Li}$ : the load at  $i^{\text{th}}$  bus

$A_p$ : system connectivity matrix of  $p^{\text{th}}$  region.

$x_p$ : PMU placement vector of  $p^{\text{th}}$  region

$k$ : number of buses in  $p^{\text{th}}$  island.

$A$ : system connectivity matrix.

## INTRODUCTION

In general, power system is highly prone to interruptions in power supply even though many attempts were made to reduce the chances for the occurrence of failures. Sometimes, the power to a complete network will be lost and causes complete outage of network elements like generators, transformers and loads. This phenomenon is called Blackout, which is the most dangerous outage than any normal outage [1]. So, the power system elements need to be restored after blackout. The Build-up strategy achieves this restoration. This power system restoration should be effective as the latency in restoration leads damage to loads, and incurs economic and political costs. The build-up strategy proposed in [2] is followed in this work as it interconnects the islands after being restored separately.

The planning and importance of Build-up strategy are clearly explained in [2-5], but they failed in introducing ideas to sectionalize a network into separate islands. Reference [6] has suggested a method for sectionalizing the power system into islands but as it doesn't consider Generation-Load constraint during initial partitioning, it was failed in producing

stable islands in initial partitioning and more number of islands for larger systems. The proposed technique has partitioned without disturbing the observability of every bus in every island.

A model based algorithm for partitioning the WAMS into different regions is proposed in this paper. Unlike [6], it considers generation-load constraint initially, and applies the observability constraint in the final stage of partitioning. Interestingly, this will improve the stability and the number of all the feasible islands. Hence, by separating the faulty islands, it protects the power system from the most dangerous events such as blackouts. Later, it suggests a new placement technique for placing Phasor Data Concentrators (PDCs). The proposed methodology is explained with the help of an IEEE-30 system.

This paper is organized as follows: the optimal PMU placement for the completed network is presented in section I. Section II discusses the constraints of restoration. Sections III and IV describe network partition and final modification. PDC placement is presented in section VI. Section VII concludes the paper.

## I. OPTIMAL PMU PLACEMENT

The PMU uses Kirchhoff's laws to calculate different electrical quantities of all the buses connected to the bus where it is located. This section identifies the number of PMUs required for observing the system completely. Initially, the optimization problem was introduced in [7]. After, many heuristic method based approaches were presented to solve the optimization problem.

The proposed Optimal PMU Placement problem uses Binary Cuckoo Search (BCS) method for identifying the minimal PMU locations for complete observability. The locations of PMUs obtained using BCS are listed in Table 1. The problem can be formulated as:

Minimize

$$\sum_{q \in N} x_q \quad (1)$$

Subjected to  $s_p(X) \geq 1, \forall p \in N \quad (2)$

Where  $s_p = \sum_{q \in N} c_{pq} x_q, \forall p \in N \quad (3)$

# Modeling, analysis and simulation of two level, three level voltage source converter for HVDC system

International Conference on Recent Innovations in Electrical, Electronics & Communication Engineering - (ICRIEECE)

## Modeling, Analysis and Simulation of Two-level and Three-level Voltage Source Converter for HVDC System

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**Abstract**—With the development of power electronics technologies, control techniques and equipment, a new generation of HVDC technology based on Voltage Source Converters (VSC-HVDC) has evolved and becoming popular for power transmission under the sea and with underground cable. VSC-HVDC converters consist of Insulated Gate Bipolar Transistors (IGBT'S) switches, these IGBT switching devices work with high frequency Pulse Width Modulation (PWM) to get high-speed control of both active and reactive power and to create the desired output voltage waveform. This paper presents modeling, current control scheme and results of simulation studies on two-level and diode clamped three level inverter based VSC-HVDC system. Comparison of %THD for two-level and three-level VSC-HVDC system is also presented at the end.

**Index Terms**—VSC-HVDC, Two-level, Three-level,

### I. INTRODUCTION

High Voltage Direct Current (HVDC) technology is an efficient and flexible method to transmit power compared to conventional AC transmission [1]. HVDC uses power electronics technology with high voltage and power ratings. HVDC usage instead of High Voltage Alternating Current (HVAC) for high power transmission is advantageous [6] for long distance power transmissions, long submarine power crossing, bulk power delivery with low line cost and losses [4]. HVDC offers an economical and reliable technique for asynchronous interconnections [1] between AC networks, renewable resources integration, fast and dynamic power flow control, and power system stability improvement [5]. As a result of using VSC technology and PWM, the VSC-HVDC has a number of potential features compared with classic HVDC [2].

The features allow VSC-HVDC converters to be suitable for a large range of applications related to power flow flexibility, fast response and recovery after the disturbances being cleared. As a result of these merits VSC-HVDC has been an area of growing interest, and it is also expected that VSC-HVDC will play an important role in future power systems. Hence, modeling, simulation and control aspects are essential for power system studies and interactions.

### II. VSC-HVDC

HVDC system based on VSC shown in Fig.1 normally uses the six-pulse connection. This converter produces lesser harmonics compared to LCC 12-pulse converter that in turn reduces the circuit complexity. By this, the construction of the converter transformer is becoming simple [3].

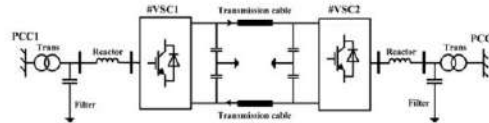


Fig. 1. VSC-HVDC system

#### A. Control strategy

In case of VSC-HVDC transmission systems, the transfer of power is controlled in the same approach as in the case of a classic HVDC transmission. The rectifier side controls the DC voltage, while the inverter side controls the active and reactive power [8]. With classic HVDC the reactive power cannot be controlled separately as of as the active power. VSC-HVDC makes it achievable to control the reactive and active powers independently. The reactive power flow can be controlled autonomously in each converter by the AC voltage that is requested set manually without changing the DC voltage. Thus, the active power flow, the reactive power flow and the DC voltage can be controlled using VSC-HVDC.

#### B. Current controller scheme

Current control scheme is the most popular control method used for VSC-based HVDC. The basic principle of the current controlled VSC method is to control instantaneous active and reactive powers independently [8]. The current control technique is shown in Fig. 2.

By employing synchronously rotating dq reference frame in current control scheme, the active and reactive powers are controlled independently. PLL is used to synchronize the turning on or off the power devices, calculate and control the flow of active power or reactive power by



# Efficient Classification of Diabetic Retinopathy using Binary CNN

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**Abstract**— Diabetic Retinopathy (DR) is a fastly spreading disease that may lead to loss of vision if not quickly detected and treated. Early-stage detection is beneficial to restrict the progress of disease and reduces the recovery expenditure. The current detection process of DR heavily depends on domain experts. Machine-dependent approaches are gain attention with large-scale fundus image repositories to overcome this difficulty. Recent techniques with deep learning are successful in getting noticeable results with pre-trained networks. However, the increase of memory occupancy and runtime with existing models is the bottleneck. We propose Binary Convolutional Neural Networks (BCNN), which drastically reduces memory consumption and faster the execution process to combat this problem. Our model is hardware friendly and efficient in DR classification with large scale fundus images. Experiments conducted using the Kaggle dataset reduce memory consumption by 37% and increase runtime by 49% compared to the base model.

**Keywords**— Binary CNN, Deep Learning, Diabetic Retinopathy, Kaggle

## I. INTRODUCTION

Diabetic retinopathy is the result of long-term diabetes that affects the eyes and causes blindness. DR usually introduces the blood vessels into the larynx (that is, the retina), which is the main reason of vision loss nowadays [1]. While the current results may be positive, it will take time and confidence in a trained employee's knowledge. Existing DR identification solutions are time-consuming and rely on trained professional experience. Several efforts have been made in recent years to develop automated solutions for DR detection to address this issue. In the early stages, various learning and traditional mechanical methods are use to test for DR. Most of the solutions described have two components: feature extraction and detection algorithm [2]. These features components depend on the parameters of the activation tools used, such as displaying objects, lighting, objects, sound, external attention, and sensitivity to background images' quality. These feature-based methods use to execute a particular project. The color fundus photography is more complicated than traditional images. The main images are reduced in the background and are often based on discrimination between sound and objects [3].

Diabetes Mellitus Edema (DME) is a DR-related complication that occurs at any stage of DR, usually due to

fluid retention or vascular edema of the macula [4]. Structures such as microvascular, hemorrhage, heavy ejaculation, and low bowel movements are near related to DR. Each of these abnormalities indicates levels of DR in the patient. The severity of DME depends on the shortening of the main enzymes in the macula. The main reason for using a learning tool is to load the processing algorithm directly. This method works well, but it can also cause some problems. With a lot of knowledge and tools, everyone has helped to improve the DR recognition tool. However, high blood sugar levels, in the long run, destroy blood fats and nerves, causing complications such as cardiovascular disease and blindness. Early detection and treatment of DR hindered its development as progression. Automated Retinal Image Analysis Systems (ARLA) systems today are not sophisticated enough for DR classification with different stages [5]. This identification of a subtle change between classes is a daunting task for the retinal imaging technique. The diagnosis of DR depends heavily on observations and evaluation to photograph procedures that may take time, even for experienced professionals. Therefore, computer-aided automated diagnostic methods have great potential for accurate detection of DR in the clinic quickly, which can help improve the screening frequency of DR and reduce blindness [6].

Deep learning approaches have recently played an essential role in recognizing DR with Convolutional Neural Networks (CNNs) [4, 7]. The concepts of existing DR methods can be dividing into three main categories. (1) Machine learning-based approaches: Knowledge-based jobs are channel into distributor training, then distributors select candidates and further determine whether the candidate's position is damaged or not. (2) Machine learning with Deep learning approaches: These methods use deep learning to create jobs and are commonly used in machine learning. (3) Pure Deep learning approaches: With large amounts of tagged data, the pre-prepared network type can automatically display the original images with end-to-end training [7].

## II. RELATED WORK

The research carried on classifying DR using Pretrained models and customized models described in this chapter. Some of the crucial contributions relevant to the quantized features and model optimizations are discussed below.





**ICT Analysis and Applications** pp 411–421

## Feature Selection Optimization Using a Hybrid Genetic Algorithm

[E. Padmalatha](#) , [S. Sailekhya](#), [Saif Ali Athyaab](#) & [J. Harsh Raj](#)

Conference paper | [First Online: 16 December 2020](#)

**592** Accesses

Part of the [Lecture Notes in Networks and Systems](#) book series (LNNS, volume 154)

### Abstract

The curse of dimensionality plays a vital role in data mining and pattern recognition applications. There are two methods which can address curse of dimensionality namely—feature reduction and feature selection (FS). The application of FS is such that it selects the most relevant subset of features with the less redundancy. Main objective of the proposed method is to manipulate irrelevant features and redundant features in (high–medium–low) dimensional data. We will aim to provide higher classification accuracy. In this proposed method, it is

Genetic Algorithm. In: Fong, S., Dey, N., Joshi, A. (eds) ICT Analysis and Applications. Lecture Notes in Networks and Systems, vol 154. Springer, Singapore.

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**Machine Learning Technologies and Applications** pp 193–201

## An Efficient Deep Learning Based Approach for Malware Classification

[Madhurima Rana](#)  & [Swathi Edem](#)

Conference paper | [First Online: 16 March 2021](#)

**203** Accesses

Part of the [Algorithms for Intelligent Systems](#) book series (AIS)

### Abstract

With the advent of new age computing and swift development of electronic devices that are connected over the network is a biggest challenge in the field of computer science and information security. Malicious software or malware can compromise any user's sensitive data like stealing, hijacking, altering, encrypting, stealing, and tracking the activity, and so on without permission. With the mounting level of complexity of Malware detection, defense in real time is the biggest challenge in the information security domain. In the last few years, many machine learning

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Face detection authentication analysis on smartphones

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## Face detection authentication analysis on smartphones

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## Face detection authentication analysis on smartphones

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**Abstract:** Smartphones are the absolute very most widely known in addition to significant personal systems. Along with their traditional make use of, that is, referring to as and also texting, they have also been used to do multiple security-sensitive activities, including electronic banking in addition to purchasing, social networking, taking pictures, and also e-mailing. On a positive side, smartphones have boosted the quality of life by offering multiple services that customers need, for example, anytime-anywhere processing. Nonetheless, on the other side, they also pose safety as well as private privacy hazards to the customers' saved data. Consumer authentication is the preliminary series of defense to avoid unwarrantable accessibility to the mobile phone. New smartphones using Apple and additionally Samsung have utilized face features to understand their individuals. These smartphone distributors assert that this present-day technology is actually among the most risk-free and also safe and secure in addition to trusted biometrics methods. This paper checks out the functional components of the face identity method installed in these smartphones. Completion results of this particular questionnaire have presented that the majority of cell phone individuals are fulfilled with the face detection strategy while opening their phones. Nevertheless, 59 per-cent of smartphones carry out not utilize face detection approach while doing getting in the app store, offering much a lot less trust fund on this function where economic packages are consisted of.

### 1. Introduction

Face Recognition has become a brand-new means for secure and safe and secure authentication for cellular telephones. As cellular phones are coming to be substantially solid, the security of the records kept in cellphones is a subject matter of concern; the data may be e-mail handles, sensitive as well as essential information, and so on. Although today phones possess regulation protection to fund, a face recognition system is a lot extra guarded and pliable. In the face recognition component, just through examining the show screen one might open their phone display. Although figure printing is one of the



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# An IOT Based Environmental Monitoring System

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## An IOT Based Environmental Monitoring System

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## An IOT Based Environmental Monitoring System

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**Abstract:** In this paper, Our team organized an autonomous robot system that is made as well as executed to note environmental standards like temp, moisture, sky premium, and also hazardous gas attention. The robot possesses GPS coordinates as well as it may always keep files on the ThingSpeakIoT system. The mobile robot is regulated with a cell phone that runs an application built on the Android system. The whole system is discovered using a cost-efficient ARM-based inserted system called Arduino as well as additionally Raspberry Private detective which is consistent via a wireless network to the IoT system, where files are conserved, fine-tuned as well as may be accessed making use of a pc or any clever device originating from anywhere. The system might boost sensor details to IoT servers every 15 secs. The kept details might be utilized for extra customer review of the decline of pollution, additional energy and likewise supply a general dwelling establishing enlargement. The robot system has produced for cost-effective remote monitoring environmental guidelines with no human treatment to stay clear of health and wellness and also wellness threat properly. A proof-of-concept model has been established to reveal the performance of the proposed system.

### 1. Introduction

Mobile robots possess a lot of requests including monitoring as well as also security, cargo of items, house goals, in addition to, etc. These robots utilize outlook for picking up as well as steering clear of obstacles. In



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## A Trust Based Method for Providing Secure Data Transmissions in Mobile Ad hoc Networks

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**Abstract**— New days Mobile Ad hoc Networks (MANET) are being part of many other heterogeneous networks including "Internet of Things (IoT)". Because of lack of Infrastructure, dynamic topology, Constraints on resources, sharing of bandwidth, security is always a great challenge and critical concern in Mobile Ad hoc Networks. A number of security solutions are proposed but they are not sufficient to provide security in Mobile Ad hoc Networks effectively. In this paper, a trust based approach is proposed which takes into consideration the direct observations of the node and neighbor recommendations about the node under consideration for evoking the final trust. This approach calculates trust based on the behavior of the nodes by considering network parameters. Simulation results under various performance metrics show that the proposed model perform efficiently.

**Keywords**— MANET, Dynamic Topology, Security, Direct Trust, Neighbor Trust, Residual Trust, Routing

### I. INTRODUCTION

Mobile Ad hoc Networks are infrastructure less, self organizing and consists of dynamic topology. These networks will not have any centralized control. They usually forms with set of mobile nodes and exchange data dynamically with one another in the range of one hop directly [1]. In recent years, the widespread usage of cheaper and powerful wireless nodes for communication, mobile ad hoc networks have gained much more attention and emerged as most promising area [2]. Due to their growing importance because of their wireless medium, mobile ad hoc networks are used in many heterogeneous networks like Internet of things (IoT) that also includes other networks like wireless sensor networks, ad hoc networks and ZigBee. In present days, the usage of IoT devices has been increased significantly. The areas include homes, organizations, offices, industries etc.

In MANETs, all the nodes involved within the range of one hop can communicate directly and those nodes that do not fall within the range should depend on intermediate nodes for communication. Each node in the network can work as a intermediate node as well as terminal node, that means each node may generate the traffic while forwarding the packets of data received from source nodes to its neighboring nodes. The intermediate nodes has to dissipate their energy for forwarding

others data packets. Due to the infrastructure less and dynamic topology, links between the nodes can change at faster mode and suddenly. Therefore, the nodes in a MANET have to help each other for transmission of data in multi hops.

Security is critical concern in MANET due to frequent connection interruptions, bandwidth and resource constraints, and high mobility of the wireless nodes. The nodes may behave selfishly and maliciously due to the energy constraints in forwarding other nodes packets as they have to use their own energy[3]. Another significant problem in MANETs is malicious nodes can woundingly drop or alter the packets contents. Due to this nature, packet transfer to the destinations can be interrupted, which in turn decreases packet delivery ratio, throughput and reliability [4]. Trust is augmented with Security. Trust can be used as important factor in providing secure transmission in Mobile ad hoc networks. Trust worthiness of all neighboring nodes should be evaluated well before involving them in any routing decision. Finding trustworthiness of a node is always a good measure to make sure the availability of the trusted and dependent nodes for secure path and to ensure secure communication between source and destination. Conventional procedures may not help in order to find such misbehaviors that occur randomly which causes threats to the network security. Trust-based Methods that involves in detecting and isolating untrusted and selfish nodes in MANETs, has been always treated as efficient measure to encounter the security threats caused by pernicious nodes[5].

In this paper, a novel and efficient security model based on trust that combines Direct trust values and Neighbor trust values is proposed. The direct trust value is evaluated through a quantifiable model by considering network parameters. Neighbor trust is calculated by taking into consideration the weight assigned to the neighbors depending on the distance. The proposed scheme combines direct observations of the node and recommendations from various neighbors collected for calculating final resultant trust. In order to provide good performance and tractable links for secure transmission of data, the proposed solution depends on the trust factor.

The remaining part of the paper is structured as follows. Review of related literature work is presented in Section II. A trust model is proposed in Section III and Section IV shows results obtained through the simulation and shows the effectiveness of the proposed method in terms of performance metrics. Finally, Section



## Ground Water Level Analysis & Prediction

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**Abstract:** Management of ground water in India always suffered with serious problems like excessive irrigation in major canal commands and overexploitation of groundwater for all purposes. Exhaustion of water tables, saltwater infitgement, drying of aquifers, groundwater contamination, water logging and saltness, etc. are major results of overexploitation and serious water systems. In India, the highest category of groundwater is the irrigation field. This field uses almost 88 per cent of groundwater which in turn drastically decreases levels of groundwater. The goal of the proposed approach in such cases, is to predict groundwater levels based on inputs like history of groundwater and surface water level data, weather forecasts, usage of water, extraction of groundwater, other geographical data and target outputs which includes groundwater level scenario.

**Keywords:** Central Ground Water Board, Receiver Operating Characteristic, MLE-Maximum Likelihood Estimation.

### 1. INTRODUCTION

Groundwater is the one available under Earth's surface in the layers of soil and in the cracks of rock layers. An aquifer is defined as the part of rock that yields a usable amount of water. A water table is called the depth at which the water availability in the soil or rock layers under the earth get saturated completely. Groundwater gets recharged from the rainfall on the surface. It may dry out in the summer due to humid heat. Groundwater is extracted for agricultural, household, and industrial usages by means of digging and operating wells. The study involved in the extraction, movement and distribution of groundwater is hydrogeology[1].

Groundwater is freely available, more natural and less affected by vulnerabilities than surface water. That's why it is generally used for providing drinking water. As an example, among all the states of the United States, California extracts large amounts of groundwater annually as a part of usable water storage. In the US, Underground reservoirs are used for storing more water than all surface reservoirs and tanks, including the Great reservoirs. In general, many municipalities in India rely

on groundwater availability for dry to dry water supply. Earth's freshwater is almost groundwater. Groundwater is the water that exists underneath the surface of the ground within the spaces between particles and layers of soil, or in holes, breaks and cracks in rocks. Usually groundwater is available not less than 100 meters of the surface of the Soil. Groundwater can contain numerous constituents counting microorganisms, gases, inorganic and natural materials.

### 2. RELATED WORK

Groundwater Management in India is facing a lot of problems due to huge extraction and excessive irrigation. Saturation of water tables, increase in saltwater, dry out of aquifers, contamination of groundwater, non availability of water etc. are major consequences. It has been detailed that in numerous parts of the nation the water table is declining at the rate of 1-2 m/year. At the same time in some areas, the water table rise is as huge as 1 m/year. Degrading the quality of groundwater by several reasons is another problem. Groundwater users of West Bengal become panic due to increased arsenic content in shallow aquifers. Because of all these problems, the freshwater availability for all purposes like irrigation, industrial, municipal and domestic uses is reducing. Solution is to be provided for all these groundwater problems otherwise India will face a major water crisis in the near future. Looking into this situation, the Government of India has started various protective and useful measures to reduce the groundwater management issues. But the above measures do not create any impact because of political and administrative reasons and lack of awareness. Among all the countries across the world, India is the largest user of groundwater. Groundwater satisfies more than 50% of the total requirement of fresh water in the country. It withdraws more groundwater than the US and China - the next two biggest countries to pull groundwater - combined[2]. The central water resources standing committee identified that groundwater forms the major share of agriculture and drinking water supply in India in the year 2015. Irrigation occupies the major portion of the groundwater extraction which is about 89 per cent, marking it as the largest sector user in the country. Household usage sector becomes second in use of groundwater with 9 per cent. Next is the industry sector which uses only two per cent of it. Totally, groundwater satisfies 80 percent of rural domestic water supply and 55

# Hybrid Secure Cloud Storage data based on improved Encryption Scheme

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**Abstract** - Cloud computing is a utility for data storage. Data storage security has become a primary challenge. The users can access, share & transacts the data as the cloud offers services based on the user demand. The Cloud data is originated from various sources, how secure the data is? Data security issues are increasing rapidly as data is flowing across the internet. To protect sensitive information there are many encryption techniques to hide the data from unauthenticated users. To secure the data encryption and decryption methods are used by which only authorized users can only retrieve the data. But sometimes Brute force method can recognize the hidden data. To enrich data confidentiality and authentication problems, a proposed method is used in which combination of AES and proxy re-encryption with Honey encryption is used. The system improves the data security for outsourced data. Honey encryption with hybrid cryptography can make unauthorized users to access only plausible looking messages.

**Keywords** – Cryptography, Honey Encryption, AES, Proxy Re-encryption.

## I. INTRODUCTION

Cloud computing proved to storage information with many users like organizations, government bodies and enterprises. As data consists of sensitive data security and privacy acts as a crucial role for hiding sensitive data with unauthorized parties. Many existing methods adopted for securing data in cloud but still there are many limitations. Researchers had developed algorithms to protect sensitive data such as posing with Access control and fine-grained like attribute-based encryption, identity-based encryption, homomorphic encryption, role-based encryption, proxy re-encryption, searchable encryption algorithms. [16]

As data is growing every user is storing the data in cloud storage. In which data consists of all personal sensitive data. Cloud providers should secure the sensitive data. For securing the data from unauthorized user's data should be encrypted before uploading into the cloud the data and the secret key will be only given to an authorized user.[6] Encryption methods are used to hide sensitive information from unauthorized users. Protecting private data by encrypting them and retrieve them only when a user has its key to decrypt it.[2]

In this paper, Honey Encryption is combined with AES and proxy Re-Encryption algorithm by which more security is provided to the sensitive data and improves data confidentiality and integrity. Combining two algorithms which give better security.

Honey Encryption is a way in which encrypted data is stored under a password using DTE. When an attacker tries to open with a wrong password doesn't allow him to open the correct data. It gives fake Honey terms looks like a real data. Thus, users who tries for guessing password to open the file will not be able to recognize whether given output data is correct or wrong data.[3]

## II. RELATED WORK

To protect data from unauthorized users the common method used to hide data is used to encrypt the data before uploading into the cloud storage.[6] Many symmetric and asymmetric encryption algorithms are used for encryption. In which symmetric encryption is used with only on key at senders and receiver's side. Asymmetric keys are used with two keys one for encrypting with public key and another secret key I used for decrypting it.

For cloud storage proposed a combination of ABE and secret key with fine grained access control [15] ABE and proxy re-encryption provide more security to cloud data. PRE is a third-party server to re-encrypt the file again when the files are uploaded in encrypted format.[6]

To overcome the brute force attack from protecting sensitive information used Honey encryption. With the other encryption techniques, it has limitation with brute force method. Thanda. W et.al [4]. To find unauthorized users in online banking applications used Honey encryption Soof. T. et.al [5]. The proposed system explained about the hybrid encryption with fully homomorphic with additive RSA encryption. Zainab. H. M et.al [6]

According to symmetric encryption cloud storage is used by adopting multiple keys and file partition techniques Li et al. [16]. Proposed a method of "combined encryption with ABE and fine-grained access control in cloud storage data" [4]. In health applications ABE and PRE is used for securing sensitive information of a patient. In this method all health-related data is encrypted and re-encrypted using PRE [9]

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International Conference on Computational Intelligence in Data Science  
ICCIDS 2020: **Computational Intelligence in Data Science** pp 157–169

## Role of Distance Measures in Approximate String Matching Algorithms for Face Recognition System

[B. Krishnaveni](#)  & [S. Sridhar](#)

Conference paper | [First Online: 20 November 2020](#)

**252** Accesses

Part of the [IFIP Advances in Information and Communication Technology](#) book series (IFIPAICT, volume 578)

### Abstract

This paper is based on the recognition of faces using string matching. The approximate string matching is a method for finding an approximate match of a pattern within a string. Exact matching is impracticable for a larger amount of data as it involves more time. Those issues can be solved by finding an approximate match rather than an exact match. This paper aims to experiment with the performance of approximation string matching



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EAIT 2021: **Advanced Techniques for IoT Applications** pp 93–102

## Food Calorie Estimation System Using ImageAI with RetinaNet Feature Extraction

[G. Kiran Kumar](#), [D. Malathi Rani](#), [K. Neeraja](#) & [Jeethu Philip](#)

Conference paper | [First Online: 03 August 2021](#)

**426** Accesses

Part of the [Lecture Notes in Networks and Systems](#) book series (LNNS, volume 292)

### Abstract

People across the world are being more health conscious in their weight, having a healthier diet and avoid obesity. A system that estimates calories and nutrition in food which can be differentiated depending upon its used ingredients can be very useful. So, we propose a system of design and implementation of food calorie estimation system using ImageAI which can recognize the food and gives the list of ingredients and measure of calories before consuming. We propose estimation of category of food type simultaneously along with the

Dr. Debashis De

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**ICCE 2020** pp 1507–1515

## Deep Learning in IVF to Predict the Embryo Infertility from Blastocyst Images

[Satya kiranmai Tadepalli](#)  & [P. V. Lakshmi](#)

Conference paper | [First Online: 12 October 2020](#)

**1025** Accesses

Part of the [Lecture Notes in Electrical Engineering](#) book series (LNEE, volume 698)

### Abstract

In Vitro Fertilization (IVF) is used to solve infertility problem caused due to damaged, blocked, weak, total absence of fallopian tubes and issues in sperm or endometriosis. Successful IVF depends on assessment of embryo quality. In visual morphology, assessment produced by embryologists are different, as an outcome low success rate of IVF is seen. To develop the success rate multiple embryos are planted which lead to several pregnancies and complications. Artificial Intelligence (AI) method can be followed to analyze embryo quality apart from

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**Proceedings of International Conference on Intelligent Computing, Information and Control Systems** pp 449–460

## Instrument Recognition in Polyphonic Music Using Convolutional Recurrent Neural Networks

[Bhargav Ram Kilambi](#) , [Anantha Rohan Parankusham](#) & [Satya Kiranmai Tadepalli](#)

Conference paper | [First Online: 25 January 2021](#)

**392** Accesses

Part of the [Advances in Intelligent Systems and Computing](#) book series (AISC, volume 1272)

### Abstract

Sounds or music usually occurs in an unstructured environment where their frequency varies from time to time. These temporal variations are one of the major problems in the music information retrieval. Additionally, polyphonic music or polyphony is simultaneous combination of two or more tones or melodic line, where each line is an independent melody of an instrument. As a result, identifying various instruments from recordings of polyphonic music is difficult and inaccurate using conventional



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## *Cloud-based Internet of things for Smart Water Consumption Monitoring System*

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**Abstract** - The levels at which groundwater is depleting around the world is alarming and there is an impending necessity to be judicious with water usage. This led to the formulation of a consolidated architecture to monitor water consumption at the household level. Internet of Things (IoT) is combined with the Thingspeak Cloud Computing platform and Android Studio to facilitate an efficient dashboard for consumers. The proposed model aims at imbuing a sense of responsibility in the citizens as it helps keep a track of water usage periodically using visually appealing charts, lays down the monthly water utility costs as well as provides tips with all in the form of a compact android application in their phones that is needed to be proactive and conserve resources. This paper presents a tested prototype and the pipeline connecting the hardware and software components responsible for streamlining the process of data transfer from IoT to cloud and from cloud to the android application. An overview of the promising technologies and frameworks that have been orchestrated in the development of the system as well as results obtained are thus provided.

**Keywords** - Water Consumption Monitoring System, Internet of Things(IoT), Thingspeak Cloud, Android Studio

### I INTRODUCTION

Water is one of the primary sources of survival for all life forms on earth. A lot of our day to day activities such as bathing, cooking, washing is dependent on the use of water. The community needs water for various activities beginning with the production of food [6] and irrigation. But now the world is heading towards a water crisis due to the excessive and uneconomical use of water by the large human population[8]. The World Economic Forum has announced in 2015 that the water crisis ranks the eighth global risk with the highest likelihood of

occurring within 10 years[4]. This has left many fearing that the shortage of water is probably going to be the most important cause of conflict in the coming years[1]. The importance of groundwater conservation practices has undergone a gradual increase as it can lessen wastewater discharge which can further result in improved water quality. They also diminish the necessity to search for or create new water sources, leaving them in reserve for future use. Hence it is extremely important to conserve groundwater by constantly monitoring and regulating usage starting at the individual household level. The designated system strives to achieve just that. One of the main objectives of the system is to imbibe a sense of responsibility in the citizens by preaching the importance of water and its conservation. The monitoring dashboard provides tips for being conservative with the daily usage consumption and also allows them to set limits on the same. Once the limit is approached or has reached, the consumer receives an alert regarding the same, leaving room for usage reduction.

Some of the real-time applications of the system in the domestic/household-front include -

- i. Track units of water consumed hourly/daily/weekly/monthly.
- ii. View live analysis of consumption statistics in the form of interactive charts.
- iii. Set limits on water consumption and receive alerts when the limit approaches or has reached.
- iv. Receive monthly water utility cost bills and log reports based on the units consumed.
- v. Be mindful of the usage by receiving tips on conservation timely.
- vi. Educate residents as well as house help personnel.

The organization of the rest of the paper is as follows. Section II briefly overviews the technology involved

## A Review on Machine Learning Trends, Application and Challenges in Internet of Things

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**Abstract:** The rapid growth of the internet and its connecting devices makes the things connected to the entire world. In these days, the world is running on the internet of things (IoT), with the increased communication capability and most effective way of communication and transmission lines many of things are connected to the internet. The advent and revolution in smart sensor technology attracts many of the users and most of the devices are connected to the internet. Internet connected sensors and devices generate exponential data. Knowingly or unknowingly IoT is generating lots of data. This data is significant in decision making system, but the problem is how to segregate this data for the future analysis purposes. The Internet of Things (IoT) offers engineering teams an innovative way to collect data and observe the status of their products, services and equipment in the field. Machine learning techniques are used to learn from these data to make the device or thing intelligent. For example, using the machine learning identifying the abnormalities from our wearable and taking necessary actions like calling doctor and ambulance automatically when it necessary.

**Keywords:** machine learning, data analytics, Internet of things, smart city.

### 1. INTRODUCTION

The significance of automation of the industry makes the life of the person more comfortable and easy. With the advent technologies like artificial intelligence and machine learning makes the apathetic things likes computer, robot, mobile phone etc., are able to learn and intelligent. It has been anticipated that very soon all the different things that are going to be connected, that we are seeing around us. They are all going to be interconnected. Unification of technologies such as low-power embedded systems, big-data, cloud computing, machine learning and networking is required to enable the powerful technologies. The enormously generated data will be the biggest problem in these days, how can we utilized these generated data and what is the purpose of this data are the big questions. Fortunately, there is an emergent technology growing concurrently with the IoT that has the potential to stave off the hypoxia in these stagnant data lakes and instead turn them into a healthy ecosystem of usable information. By funneling big data into machine learning algorithms, engineers can breathe life into their development cycles, operations, manufacturing and more. In this work we are trying to identify the scope of the machine learning for IoT. The main challenges and trends of the machine learning techniques in deriving the knowledge for the IoT community to make the devices more automated.

The major share of the IoT comes from its connectivity, connecting anything, anytime anyplace, it make sure what is going to be observed in this new era of ubiquitous computing [3]. It makes the digital world, that is going to result in billions and trillions of things are connected. it means,



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**Recovery of Copper Ore by Using Flotation Techniques  
and microbe- mineral surface interaction**

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**Abstract:--**

In this study, the recovery of copper from a high grade ore was attempted employing a chemolithotrophic micro organism, a bacteria named *Acidithiobacillus ferrooxidans*. The aim of the present study is to understand the changes in Copper ore beneficiation based on surface chemical properties of bacteria during adaptation to high grade copper minerals and the projected consequences in flotation and bio-flotation processes. The utility of bio processing in the beneficiation of Copper ore through bio-flotation is demonstrated in this work. An autotroph *Thiobacillus ferrooxidans* bacteria is adapted to high grade mixed copper ore sample, which was supplied from HCL Malankhand Copper Plant, Open cast mines. The first step in the procedure was the collection and activation of the bacterial strains of *Acidithiobacillus ferrooxidans*. The bacteria were raised in a culture of 9K media supplied with adequate calculated amount of nutrients and were shaken continuously in a shaker cum incubator to fully activate them at room temperature. Copper sample was adapted by repeated subcultures of bacteria. The surface characteristics were studied Zeta Potential by analysis at different Ph values and different time



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